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THE BIOLOGICAL LABORATORY OF THE BUREAU OF FISHERIES AT WOODS HOLE, MASS.

REPORT OF THE PAST YEAR'S WORK, AND ANNOUNCEMENT FOR THE COMING SEASON

IN the spring of 1908 two of the larger rooms of the laboratory were equipped for chemical investigations, and during the succeeding summer these rooms were occupied by five chemists who were engaged upon various problems of organic analysis. The purchase of books for the library has been continued, and five new periodicals have been added to the list of those which will henceforth be received here. These are the *American Journal of Physiology, American Journal of Anatomy, Journal of Experimental Zoology, Anatomischer Anzeiger* and *Centralblatt für Physiologie.* A considerable number of volumes, including the back numbers of several important journals, were loaned for the season by the library of the Bureau at Washington, and it is hoped that this profitable arrangement will be continued in the future. The entire library of the Woods Hole laboratory has been transferred to glass cases, and will henceforth be more effectively protected against the summer fogs.

Thirty-one investigators were occupied with various researches in marine biology or biochemistry during the past season. Of these eighteen received salaries from the bureau, either as investigators or as scientific assistants. In addition nine other assistants were comprised in the laboratory staff. The subjects of research were as diversified as in past seasons, though problems of economic importance perhaps received a rather larger share of attention.

Among the topics of investigation may be mentioned: chemical analyses of the tissues and the eggs of certain marine organisms, the natural history of the sea-mussel and other mollusks, the reactions of marine organisms to light and to chemical stimuli, hybridization in fishes, the parasites of fishes, taxonomic studies of cœlenterates, bryozoa and crustacea, and various other problems in general physiology, ecology, cytology and embryology.

The season was marked by an endeavor to bring about more intimate social relations among the investigators of the Fisheries Laboratory themselves, and between the latter and those of their neighbor, the Marine Biological Laboratory. With this object in view, several informal "smokers" were held in the course of the summer, and by general agreement these occasions were regarded as highly successful, both in the furtherance of friendly cooperation among the local scientific colony and the stimulus given to individual efficiency. At the close of September, Woods Hole was visited by a considerable delegation from the Fourth International Fisheries Congress, which had just concluded its formal session at Washington. The visitors were conveyed to Woods Hole from Wickford, R. I., upon the steamer *Fish Hawk,* leaving for Boston by rail on the same day. The delegation included some distinguished fisheries experts and men of science from Europe, Asia and North and South America.

At the present writing, the long-heralded report upon the local biological survey is very nearly completed and with little doubt will be ready for publication by the close of the present summer. The following sections of this laborious work are now finished: (1) The list of organisms (so far as identified) which were taken at each of the 424 dredging stations. This station record covers over 750 manuscript pages and includes about 450 species of animals and about 90 species of plants. (2) Maps showing the distribution of all of those species which were taken at ten or more of the dredging stations.[1] There are more than 200 of these representing the fauna, about 40 representing the flora. Other charts have been prepared, showing character of bottom, water temperature and density at various seasons, geographical relations, etc. (3) The census of the local marine fauna and flora, based upon the survey dredgings and upon all other available data. The resulting annotated list occupies about 700 manuscript pages and records the occurrence of some 1,400 species of animals and over 250 species of plants. (4) The general account of the project, with summarized results, discussion, etc. This has only been finished in the rough. A final draught will be made during the next few months, thus completing the report. A brief discussion of the work, containing some of the more important general conclusions, was prepared by the writer for the Fourth International Fisheries Congress, and is being published in the proceedings of that congress.

In response to an appeal from the health board of Salem, Mass., the director of the laboratory was instructed by the commissioner to detail one of the investigation staff to visit that city for the purpose of inquiring into the cause of a serious mortality among the fishes in that neighborhood. Dr. C. L. Alsberg was chosen for this mission, and proceeded at once to the seat of the trouble. He found that enormous numbers of fishes, chiefly herring and whiting, had been stranded along the waterfront of the city, causing serious discom-

[1] This basis of selection has not been adhered to strictly either for animals or for plants. In the case of the plants the number of such species would in reality considerably exceed that given.

fort to the inhabitants, if not actually menacing their health. There was no evidence of an epidemic among the fishes, as had at first been feared. Great schools of them had come into dangerously shoal water, perhaps as the result of pursuit by predaceous species, and had been stranded by the receding tide. There was thus nothing to be done but to remove the offal, and to pray that the catastrophe might not be repeated.

A few notes seem worth while regarding certain species of animals which have been taken at Woods Hole, during the past year. *Orthopristis chrysopterus,* a fish belonging to the family Hæmulidæ, which is common farther south along our Atlantic coast, was taken for the first time in the vicinity of Woods Hole. A specimen of the "flasher" or "triple-tail" (*Lobotes surinamensis*) was captured at Nantucket. There have been very few previous records of the occurrence of this fish locally. A small crab, *Dissodactylus mellitæ,* which lives in association with echinoids of the "sand dollar" type, was taken in Vineyard Sound, though probably not for the first time. A curious case deserves mention of one fish becoming encysted within the body of another. In May, 1908, Mr. V. N. Edwards chanced to open a large hake (*Urophycis tenuis*) in the course of his search for parasitic worms. The hake seemed to be in perfect health and its stomach was nearly filled by a whiting, which had been recently swallowed. Upon examining the body cavity, a long slender object was found, completely inclosed within a fold of the peritoneum. This proved to be a dead fish, having a decidedly "mummified" appearance. Its body was 25 cm. in length. Skin, and for the most part finrays, were lacking, and the flesh was much shrunken and extremely hard. From the general bodily proportions of this fish, and the presence of a frontal spine, it is believed by the writer to belong to the genus *Leptophidium.* Several members of this genus have been taken off the coast, at great depths, and it seems likely that the present specimen came from a considerable distance. It had probably been swallowed by the hake, escaping subsequently through the wall of the stomach, perhaps by using the frontal spine as a perforating organ. The stomach of the hake had evidently healed completely after this adventure.

The fact does not seem to have been hitherto recorded that the "hawk-bill" or tortoise-shell turtle (*Eretmochelys imbricata*) not infrequently reaches the coast of southern New England. Its occurrence has not been mentioned in any list of the reptiles of Massachusetts, and I have found no reference to its having been observed north of North Carolina. Small specimens of both the loggerhead and hawk-bill are, however, occasionally taken in local fish traps, and one or two of the latter have been preserved in the museum of the laboratory. A specimen ten or twelve inches long was taken among floating *Sargassum* by Mr. Edwards in August, 1908, and was kept for some time in the shark pool of the station. I learn from Mr. Edwards that individuals as large as eighteen inches long are not infrequently captured. This species is readily distinguished from the loggerhead (*Caretta caretta*) by the presence of four costal shields, instead of five as in the latter, and from the green turtle (*Chelonia mydas*) by the presence of two prefrontal plates on each side of the head.

The following is a list of the investigators present during the season, together with their subjects of research:

Carl L. Alsberg, Ph.D., instructor in biochemistry, Harvard University:[2] (1) chemical composition and food value of certain marine organ-

[2] Now pharmacologist in the Bureau of Plant Industry.

isms; (2) investigation of death of fishes at Salem, Mass. (*Salaried investigator.*)

Charles B. Bennett, graduate student in Brown University, assisted Dr. Alsberg in chemical investigations above mentioned. (*Scientific assistant.*)

William M. Clark, A.M., assistant in chemistry, Williams College, likewise assisted Dr. Alsberg. (*Scientific assistant.*)

Edgar D. Congdon, A.M., Austin teaching fellow in zoology, Harvard University: a comparison of the marine and the brackish-water representatives of certain species of mollusks. Mr. Congdon also acted as librarian of the laboratory.

Bradley M. Davis, Ph.D., Cambridge, Mass.: (1) botanical section of the biological survey; (2) cytological studies of marine algæ. (*Salaried investigator.*)

Donald W. Davis, professor of biology, Sweet Briar College: the effect of conditions acting at the time of the fertilization of the fish egg upon the subsequent size and proportions of the organism. (*Scientific assistant.*)

Irving A. Field, professor of chemistry and biology, Western Maryland College: (1) the utilization of the dogfish and mussel as food; (2) the life history of the sea mussel. (*Salaried investigator.*)

A. J. Goldfarb, graduate student in Columbia University: the influence of the nervous system upon the regeneration of various organisms.

Charles W. Hargitt, Ph.D., professor of zoology, Syracuse University: the morphology and taxonomy of local cœlenterates. (*Salaried investigator.*)

George T. Hargitt, A.M., Austin teaching fellow, Harvard University: the embryology of hydromedusæ.

George W. Heimrod, Ph.D., assistant in Rockefeller Institute of Medical Research: (1) studies of the enzymes found in marine organisms; (2) preparation of the flesh of fishes for future analysis.

Edwin Linton, Ph.D., professor of biology, Washington and Jefferson College: the helminth parasites of fishes. (*Salaried investigator.*)

Samuel O. Mast, Ph.D., Johnston research scholar, Johns Hopkins University:[3] the reactions of certain marine organisms to light. (*Scientific assistant.*)

James W. Mavor, graduate student, Harvard University: the development of the coral, *Agaricia fragilis.*

Jesse F. McClendon, Ph.D., instructor in zoology, University of Missouri: the chemistry of the echinoderm egg. (*Scientific assistant.*)

William J. Moenkhaus, Ph.D., professor of physiology, University of Indiana: the development of certain fish eggs, after fertilization with spermatozoa from other species or genera. (*Salaried investigator.*)

R. C. Mullenix, Ph.D., professor of biology, Yankton College: the development of the neurofibrillæ in the eighth cranial nerve of *Fundulus heteroclitus.*

Raymond C. Osburn, Ph.D., instructor in zoology, Barnard College, Columbia University: a systematic study of the bryozoa of the Atlantic Coast. (*Salaried investigator.*)

George H. Parker, Ph.D., professor of zoology, Harvard University: (1) the sensory reactions of the dogfish; (2) tests of the hearing of various fishes. (*Salaried investigator.*)

Fernandus Payne, graduate student, Columbia University: studies of chromosomes.

Henry F. Perkins, Ph.D., assistant professor of zoology, University of Vermont, spent a few days in quest of early stages of *Gonionemus.*

Alice Robertson, Ph.D., instructor in zoology, Wellesley College: identification and classification of bryozoa collected by the steamer *Albatross,* in the northwest Pacific in 1906.

A. P. Romine, instructor in biology, State Normal School, Bellingham, Wash.: a study of local crabs.

George G. Scott, A.M., instructor in the College of the City of New York: changes in the specific gravity of the blood of fishes, resulting from changes in the density of the water. (*Scientific assistant.*)

R. W. Sharpe, M.Sc., instructor in biology, DeWitt Clinton High School, New York City: systematic studies of marine entomostraca.

Ralph E. Sheldon, Ph.D., assistant in anatomy, Chicago University: the reactions of fishes to chemical stimuli. (*Scientific assistant.*)

Bertram G. Smith, instructor in zoology, Syracuse University: the embryology of *Cryptobranchus.*

Francis B. Sumner, Ph.D., director of the laboratory: (1) report upon the biological survey; (2) studies of the ecology of the native periwinkle, *Litorina palliata* (with Jas. W. Underwood).

[3] Now instructor in the Woman's College of Baltimore.

James W. Underwood, teacher of biology, high school, Negaunee, Mich.: color variation and other features of the natural history of *Litorina palliata*. (*Scientific assistant.*)

Donald D. Van Slyke, Ph.D., assistant in Rockefeller Institute for Medical Research: the action of enzymes.

Edward M. Weyer, Ph.D., professor of philosophy, Washington and Jefferson College: the behavior of the remora.

The facilities of the laboratory have likewise been utilized to a considerable extent during the months not comprised in the regular summer session. Dr. B. M. Davis and Mr. George T. Hargitt occupied tables during the spring of 1908, and Dr. Davis has enjoyed the privileges of the laboratory throughout the entire winter of 1908–9. For the past three years the director has resided almost continuously at Woods Hole, occupied primarily with the report upon the biological survey. In the compilation of this report he has been assisted, first by Mr. J. W. Underwood and later by Miss E. M. Chapman. From time to time requests have been received from investigators at various institutions for materials for embryological or other studies, or specimens of marine plants and animals. Some of these persons have come to Woods Hole for this purpose. While it is far from the policy of the bureau to operate a supply department for the free distribution of marine specimens, such requests for materials have in special cases been granted. In general it may be said that the demand for a marine laboratory which shall be operated continuously throughout the entire year is increasing, and it is the frequently expressed hope of many persons that the Bureau of Fisheries will in time be able to make provision for the maintenance of such a station at Woods Hole.

During a portion of the coming season the director will be relieved of all administrative duties in connection with the laboratory, in order that he may complete several pieces of unfinished work. During this period, Dr. Raymond C. Osburn, of Columbia University, will serve as acting director.

It is requested that applications for laboratory tables shall be submitted at the earliest possible date.

FRANCIS B. SUMNER

WOODS HOLE, MASS.,
April 30, 1909

THE PLANS AND WORK OF THE GEORGE WASHINGTON UNIVERSITY

THE discussions in the public press seem to call for an authoritative statement of the educational work and condition of the University.

1. Prior to 1902, when the present administration assumed charge, there was a day college, with less than a hundred students, and a faculty of eleven professors and teachers. There was also the Corcoran Scientific School, doing undergraduate work in the evening, which was conducted by the professors of the day college. These professors received salaries in the day college ranging from one thousand to eighteen hundred dollars a year, and seventy-five per cent. of the students' fees for the evening work. This arrangement was made between the faculty and the university to prevent any liability on the part of the university for the expenses of the evening college. In this college there was some work given in engineering and architecture. The Law School was conducted by lawyers in practise and judges in service, no one giving his entire time and attention to its management or to teaching. The Medical School was conducted in the same way, by practising physicians, there being no professional teachers employed giving their whole time to the educational work.

2. The first change adopted under the present administration was to discontinue the Corcoran Scientific School, merge it with Columbian College, and require all class-room

work to be done between the hours of nine in the morning and half-past six in the afternoon; the laboratories and libraries to be kept open, with assistants, until ten o'clock. The objects in view were to unite the student body and create a spirit of unity, and place all the college work upon the basis of absolute equality. The entrance requirements were advanced to conform with those of eastern colleges. Part of the work taken by full-day students and all of the work of the part-day students was given in the afternoon between half past four and half past six o'clock, so that the two groups came into class-room association. As the students employed during the day do not have the same time for the preparation of their class work, they were limited to a less number of hours per week. This increased the period within which the half-day students could earn a degree by one or two years. The effect of this change upon the faculty was to put all of the professors on a salary basis, cutting out the fee system. In the faculty there were differences of opinion as to the wisdom of this change.

3. The next change inaugurated was to employ professional teachers in the professional schools. In the Law School, four men, exclusive of the President, are now employed. who give their entire time to teaching. They teach by the case method, which requires much time in preparing for class work and trained ability to impart knowledge. This does not displace or in any way discount the excellent work done by lawyers and judges of very high standing who are still conducting work in the school. Its purpose was to establish in the City of Washington a law school of the type prevailing in the best universities, where men who desire the most thorough training in the law would be able to secure it. A full day law course beginning in the morning was established, with fourteen hours work per week required. This was done to attract the students who give all their time to study and desire to have it fully occupied. An afternoon course of ten hours per week is given for students employed through the day. Thus the needs of the two groups of students were met. To the students giving part of their time a less number of hours is required, but the same quality of teaching provided. By increasing their attendance to four years afternoon students may cover the entire work while full day students complete it in three years. The part-day students may receive the Bachelor of Law (B.L.) degree at the end of the third year. This plan has met with hearty approval from students who are serious-minded and desire to secure the best legal education. These changes have raised our standing in the Association of American Law Schools, and enable our graduates to pass successfully the Bar examinations in all the states. Not one graduate last year failed in these examinations.

4. The changes in the Medical School involve practically the same educational problem and were met with the same objections as those in the Law School. The administration advocated the extension of the laboratories and the employment of specially trained men to teach the laboratory courses. This was done and resulted in the employment of four professional teachers on regular salaries to do this work. The expense involved was the increase of the salary list and the expenses in establishing and maintaining the laboratories. Another change was to increase the clinical teaching, first by requiring men in their graduating year to give their full time to the work in order that they might give full time to the clinic. This was afterwards still further advanced by making the school a full day school, so that students would have their whole time both for laboratory and clinical courses. Didactic lectures are still continued and should be, but the laboratory and clinical teaching is essential to a scientific training. The effect of these changes was to decrease the number of students and the income, at the same time increasing the expenses; but it enables us to retain our position in the Association of American Medical Schools, and enables our graduates to take the medical examinations before all State Boards. It gives us a better standing among medical institutions, and

most of all, will, when the plan is thoroughly worked out, give to each student a thorough training that will enable him to take a high position in his profession, and thus give additional reputation for the school.

5. It will be observed that in all these changes there was but one object in view, to improve the educational standards and methods, bringing them as near as our resources would permit for the standards and methods prevailing in the best institutions. We would not claim to have attained all we hope to attain. This is not the fault of the plans but because of the lack of funds to completely carry out the plans in all particulars. The advances made, however, are great and the advantages to the students and the university are manifest. It would be a matter of profound regret to have these new developments abandoned. Washington needs professional schools of the highest type and should have them.

The next change made was to segregate the work done in engineering and architecture from the liberal arts college. The College of Engineering, the division of architecture, were established. This involved some increase in the expenses, but it has added a fine body of over 200 students to the university, thus increasing the income from students' fees. Additional work was provided in purely technical courses, and through the generous gifts of apparatus by friends, a good laboratory in electrical engineering was created, and a beginning made in a mechanical laboratory. In establishing the College of Engineering it was not intended to make a complete polytechnic school, but simply to put in technical courses and allow the students to take about half of their work in the liberal arts college.

The moving cause for this change was to give the young men of Washington an opportunity within their means to prepare themselves for skilled service in the great professions of engineering and architecture. Washington, with few industrial or commercial openings, offers few opportunities for high grade skilled employment to the rising generation. Without university training in these lines, young men stand little chance of succeeding in the states, where the great state universities and privately endowed institutions are training thousands of young men in these lines. That the situation demanded the establishment of these schools is demonstrated by the large body of students from this city who are taking the courses.

7. In the act of congress providing for the organization and a salary scheme for the teachers in the public schools of the District of Columbia it was provided that new appointees to certain positions in the high schools should have a college education, including the subjects of psychology and pedagogy. These requirements shut the doors of these positions to young people in the district who are financially unable to go to colleges outside of the district. This prompted us to put in the division of education. In this division, we have a professor of psychology, a professor of education, and two lecturers upon school administration. It is not claimed that this is a rounded teachers' college, but it does give, by very competent teachers, the courses required by the act of congress, which, taken in connection with the course for the bachelor of arts degree in the College of Liberal Arts enables the graduate and holder of a teacher's diploma to secure the highest positions in the public school system. These technical courses are substantially taken care of by the tuition fees of the students taking the courses. These fees do not cover the whole expense of the education of the student, for the great body of the work is taken in the College of Liberal Arts. We assumed that if the tuitions would meet the expense of the technical work, we should add to the numbers taking the liberal arts course, meet a pressing demand and serve our city in advanced education of teachers for the public schools.

8. The College of the Political Sciences is the outgrowth of the old school of jurisprudence and diplomacy. Every scholar in this field recognizes that there are peculiar advantages for carrying on this work in the city of Washington and that the effect upon students

living for a time in this city and observing the powers of the federal government in action is most beneficial to the country at large. This college has received special contributions towards its current expenses. During the present year it received ten thousand dollars pledged for next year. We have limited the scope of the work to two years of undergraduate and two of graduate study, making the entrance requirement two years of college work. This brings all students, for the first two years, into the Liberal Arts College, but allows them free election of the courses in the political sciences in the third and fourth years of their undergraduate studies. The object in making it a separate organization was to secure contributions and endowment for the work which could not be done successfully if it was merged in a college of the liberal arts. Experience in other institutions has shown that a faculty of the political sciences is more successful when conducting the work within its own field.

9. It will be observed that all of these small branches that have put out from the main college are confined entirely to technical courses and are intended to furnish the minimum amount of such courses required to meet existing demands in the District of Columbia. The center of it all is the College of Liberal Arts, and in each of these special branches the new students have increased the numbers in the Liberal Arts College, while their tuition fees have nearly paid the salaries of the technical teachers, except in the College of the Political Sciences, and there the deficiency has been made up by special contributions.

10. In order to carry out these plans and do the work on the lines proposed, it has been necessary to fit up and maintain new laboratories and to increase the library facilities. In 1902 we had five or six thousand volumes of books in the whole institution; to-day we have about forty thousand volumes.

11. The foregoing constitutes all of the policies of the present administration which have been criticized or condemned by members of the college faculty and I put them forth without argument, in order that the people of Washington may determine whether these plans have been educationally sound, and whether or not a university serving the community in all of its needs is worthy of their confidence and support. Professors who opposed these educational advances, finding that there was call for efforts to maintain the university, went to the trustees and proposed to take the university and run it for the fees, provided the president was removed and their policies could prevail.

Had this concerted effort been successful with the trustees, not only would the "salary of the president" have been saved, but this new work would have been stricken down and many of the new professors would have been discharged. It is a matter of conjecture whether, had this plan succeeded and fifteen or twenty professors been discharged, there would have been a proportionate increase in the agitation of the public mind.

13. In regard to the pensioning of teachers, so far as I understand it, it has always been construed where a pension system existed that when a professor has become entitled to a pension, either by length of service or by age limit, he has the right to retire voluntarily at any time, and the university has the equal right to retire him when for any cause it seems expedient to do so. In the recent action it became necessary to reduce the expenses about twenty-five thousand dollars, and to distribute that retrenchment among each of the departments of the university. Of necessity the services of some of the teachers had to be dispensed with, and in selecting the ones to be retained, all things being equal, it was natural to retain those who were thoroughly in harmony with the general plans and development of the university.

The action of the Carnegie Foundation in assuming that the university had no option but could retire only those eligible who voluntarily sought retirement seems to be contrary to the usual construction of pension systems. Waiving this point, however, their action in our case was hasty and arbitrary. As the secretary sought to give the widest possible publicity to the injury done the university by

giving their letter to the press, I give my letter in reply, which states the facts regarding the procedure. It reads as follows:

June 11, 1909.

DR. HENRY S. PRITCHETT, *President*,
The Carnegie Foundation for the Advancement of Teaching.

Dear Sir: Your letter of June fourth was received while we were in the midst of Commencement week, and for that reason the answer has been delayed. Immediately upon the receipt of your communication it was presented to a special meeting of the Board of Trustees.

It is a matter of sincere regret on the part of every one who has read the letter that your organization, with its high aims for the advancement of all true efforts in educational work, should have taken this action without any notice to the university and without giving it any opportunity to be heard upon the real and apparent reason for your action, as shown by your letter. That an institution of learning, with fifteen hundred students, should be struck such a blow without warning or opportunity to correct any defects in its administration that might be shown, is difficult to comprehend, and as expressed by others than myself, almost impossible to believe. Your agent arrived here on Wednesday morning, the second instant, and was shown every courtesy that could be accorded to him. Our deans, who have the immediate charge of the educational work, although in the midst of examinations, gave up their time and showed him every consideration. At the end of the examination he came to my office and expressed in the most hearty and gentlemanly way his appreciation of the attention that had been shown him by the secretary of the university and by the deans. I asked him to make any criticisms that he desired to make to me, and assured him that we should be glad to correct any defects in our system that could be corrected. He made a few remarks regarding some of the work, part of them complimentary and part in friendly criticism, but there was no intimation that it was contemplated, or that the investigation was with a view to terminating the relation between the foundation and this university. Since the action has been taken it has been stated by Dr. Sterrett that the agent spent two hours with him and part of the time with Dr. Gore regarding the matter of their retirement. What they said of course I do not know. Had there been a fair investigation of that question with a view to your taking action regarding it, I respectfully submit that the other side of the question should have been heard. To assume that there is but one side to an issue is not only unfair but tends to create the impression that it is desired to hear only one side.

* * * * * * *

Since coming here in 1902 I have had but one aim, and that is to gradually make the institution a true university, serving this community in all possible lines of higher education—a community that has pressing needs for such advantages.

From my acquaintance with you I can but believe that upon mature reflection you will see the injustice that has been done, and will accord a hearing to the university.

With very great respect, I am,

Sincerely yours,

CHARLES W. NEEEDHAM

15. In reference to the financial conditions of the university, the treasurer has handed me a comparative statement of the assets of the university in 1900 and the assets at the close of the fiscal year 1908, which shows that in 1900 the gross assets of the university, including everything, were $905,279.45 and the liabilities were $325,719.61, leaving the net assets $579.559.84. In 1908 the total assets were $1,365,503.22, the liabilities $489,004.24, leaving the net assets $876,498.98. The increase in the indebtedness during the last period was occasioned by the completion of the new Medical School building and the Hospital in 1901–2, and indebtedness created to meet deficiencies in current expenses.

Of the foregoing assets the productive investments in 1900 were $223,509.65. In 1908 they were $127,740.91. This change in the productive assets was caused by the drain upon the funds occasioned by the increase in the cost of maintaining the university. The contributions toward the current expenses were insufficient to meet the annual deficit, and thus funds, which were properly applicable, had to be used to pay the salaries and current expenses or close the doors to progress.

It must be borne in mind that the university has always had a deficit. Its productive funds have never been sufficient to meet its expenses. In round figures $125,000 of the

indebtedness in 1900 represented borrowed money to pay accumulated deficits. Since the new policy went into effect the annual deficits have necessarily been larger than they were before, and have been incurred with the authority of the board of trustees, in the belief that the improvement of the educational standards and work, with the increased numbers of students coming in upon higher entrance requirements would so demonstrate the needs of such a university in this district that broad-minded and beneficent men would come to its aid and support the movement. It had been demonstrated by numerous efforts that no money could be obtained for the old university.

We need to secure for the expenses next year, 1909–10, $55,000 to keep the university going on its present plans. This budget has been approved by the board, and if the money is not provided it will again have to be paid out of existing assets. It is apparent that this process of meeting annual deficits out of the assets can not go on very long. The university must have financial support. If congress will give to the District of Columbia the same consideration that it gives to every state and territory and Hawaii and Porto Rico, by extending the benefits of the Morrill act to this district, and designating this university to receive the money, the appropriation would pay a little over one half of the deficit next year. We are doing the work required under the Morrill act in the mechanic arts to justly entitle us to the benefits of this fund. There is no other institution in the district that is carrying on work of university grade in the mechanic arts. If the citizens of the District of Columbia will do as Baltimore did for Johns Hopkins when it was in financial straits and what has been done in other cities for other institutions, raise by subscription a fund of $200,000, payable in five annual installments of $40,000 each, this, with the benefits of the Morrill act, would enable the university to go forward on its present plans and do its work for the district. With five years free from financial anxiety we could hope to thoroughly establish the university upon its new basis, by appeals to the country at large for adequate endowment.

Charles W. Needham,
President
The George Washington University,
Washington, D. C., June 21, 1909

PRESENTATION OF A BUST OF DARWIN

At the Darwin celebration held in Cambridge, England, from June 22 to 24, a bronze replica of the bust of Darwin, by Mr. William Couper, which was presented by the New York Academy of Sciences to the American Museum of Natural History in February last, was presented to Christ's College by the American delegates on behalf of those who recognize the influence of Darwin on American thought and science. A letter recently received from Professor Shipley states that the acceptance of this bust would take place at the time of the garden party on June 23.

The American institutions and individuals that have voluntarily contributed towards defraying the expense of this gift, its transportation and its erection in Cambridge (about $1,000) are as follows:

Ann Arbor—Research Club of University of Michigan.

Cambridge—Dr. Alexander Agassiz, Dr. Theobald Smith.

Chicago—University of Chicago.

Cold Spring Harbor, L. I.—Dr. Charles B. Davenport.

Ithaca—Cornell University.

New Haven—Connecticut Academy of Arts and Sciences, Professor Tracey Peck, Professor Russell H. Chittenden.

New York—Columbia University, Dr. E. B. Wilson, Professor Henry Fairfield Osborn, Mr. Charles F. Cox, Mr. M. Taylor Pyne, The American Museum of Natural History, Dr. Hermon C. Bumpus, Brooklyn Institute of Arts and Sciences.

Pasadena—Dr. George E. Hale.

Philadelphia—University of Pennsylvania, Philadelphia Academy of Natural Sciences.

Pittsburgh—Carnegie Institute.

Princeton—Princeton University, Professor W. B. Scott, Professor O. W. Richardson.

Washington—Smithsonian Institution, Dr. Robert S. Woodward, Washington Academy of Sciences.

SCIENTIFIC NOTES AND NEWS

DR. WILLIAM H. WELCH, professor of pathology in the Johns Hopkins University, has been elected president of the American Medical Association.

PROFESSOR E. W. MORLEY has been elected honorary president and Dr. W. H. Nichols acting president of the Seventh International Congress of Applied Chemistry, which has accepted the invitation extended by the congress through the president and the secretary of state, to meet in this country in 1912.

MR. ORVILLE WRIGHT and Mr. Wilbur Wright were presented on June 19 with the gold medal authorized by congress, a medal on behalf of the state of Ohio and a medal on behalf of the city of Dayton.

GOVERNOR SLOAN, of Arizona, has appointed, as territorial geologist, William P. Blake, Sc.D., emeritus professor of geology in the University of Arizona.

PROFESSOR F. W. PUTNAM has been appointed professor emeritus of anthropology in the University of California.

THE University of Pennsylvania has conferred its doctorate of laws on Dr. Charles B. Penrose, formerly professor of gynecology at the university.

BROWN UNIVERSITY has conferred its doctorate of science on Dr. C. V. Chapin, professor in the Harvard Medical School and superintendent of public health in Providence; on Mr. J. B. F. Herreshoff, the chemist of New York City, and on Dr. W. C. Gorgas, of the Isthmian Canal Commission. Dr. Gorgas has also received the doctorate of laws from Jefferson Medical College.

DR. GEORGE E. MACLEAN, president of the Iowa State University, gave the commencement address at Syracuse University and the degree of doctor of laws was conferred on him.

THE University of Glasgow has conferred its doctorate of laws on Dr. C. S. Sherrington, professor of physiology at Liverpool and on Mr. W. H. Maw, editor of *Engineering*.

THE senate of the University of Michigan has presented Dr. Angell with an address engrossed in parchment and bound in silver covers with symbolic designs.

A COMMITTEE has been formed in Dublin to present Professor Fraser with some token of respect on the completion of his twenty-five years as professor of anatomy in the school of the Royal College of Surgeons in Ireland.

DR. ANDREW WALKER MCALESTER, professor of surgery and dean of the School of Medicine of the University of Missouri, has resigned from the faculty of the school with which he has been connected since 1873.

PROFESSOR JOHN CLELLAND, of the University of Glasgow, who has held the chair of anatomy since 1877, and Professor William Jack, who has held the chair of mathematics in the same institution since 1879, are about to retire from active service.

DR. W. P. MASON, professor of chemistry in the Rensselaer Polytechnic Institute, has been elected president of the American Waterworks Association for the meeting to be held next year in New Orleans.

THE Harben gold medal for eminent services to the public health, has been awarded to Professor E. von Behring, of Marburg, and Lieutenant-Colonel W. B. Leishman, professor of pathology, Royal Army Medical College, has been appointed the Harben lecturer for the year 1910, and Professor Angelo Celli, of Rome, the Harben lecturer for the year 1911. The Harben lectures for 1909 were delivered by Professor R. Pfeiffer, of Breslau, on June 21, 23 and 25.

LIEUTENANT EDWARD H. SHACKLETON arrived in England on June 10. He will address a meeting of the Royal Geographical Society at the Albert Hall on June 28, when the special gold medal of the society will be presented to him by the Prince of Wales. At a luncheon given in his honor at the Royal Geographical Society on June 15, Lieutenant Shackleton announced that he contemplated another Antarctic expedition at an early date.

A CABLEGRAM to the daily papers states that Professor T. C. Chamberlin, Dr. E. D.

Chamberlin and Mr. R. T. Burton have returned to Pekin, after investigations on behalf of the University of Chicago, of China's material and intellectual resources and the possibility of American cooperation in developing education in China.

During the present season the Oklahoma Geological Survey will carry on two lines of investigation. Professor D. W. Ohern will have charge of a party in the oil fields in the northeastern part of the state, investigating the occurrence of clay, cement rock, building stone and other structural material in that region. Mr. L. L. Hutchinson, assistant director of the survey, will have charge of investigations on asphalt in southern Oklahoma.

President Whitney has appointed the following committee to represent the American Chemical Society in connection with the Hudson-Fulton celebration: M. T. Bogert, *Chairman,* New York; L. H. Baekeland, Yonkers; W. G. Tucker, Albany; M. A. Hunter, Troy; Edward Ellery, Schenectady.

Mr. Wilfred H. Osgood, of the U. S. Biological Survey, has accepted a position as assistant curator of mammalogy and ornithology in the Field Museum of Natural History of Chicago and will take up his new duties on July 1.

Dr. S. A. Barrett has been appointed to the curatorship of anthropology of the historical department of the Public Museum of the city of Milwaukee. An addition to the building, covering about 19,000 square feet and four stories in height, exclusive of basement which will contain a large lecture hall and assembly rooms, is now being erected.

Mr. Willis L. Moore, chief of the Weather Bureau, is at present in England.

Dr. H. D. Reed, assistant professor of neurology and vertebrate zoology in Cornell University, will leave this country on July 22 for study in Europe. He will be absent about a year and a half. Six months of this time will be spent at the Naples Marine Laboratory and a year at Freiburg.

Mr. L. C. Snider, A.M., University of Indiana, who was recently elected to a position of chemist of the Oklahoma Geological Survey, will spend the summer at the United States Geological Survey testing laboratories at Pittsburg, Pa., conducting a series of tests on Oklahoma clays.

Mrs. Ellen H. Richards, of the Massachusetts Institute of Technology, who is to preside at Denver at the sessions of American Home Economic Association, is to deliver an address before the Western Association of Technical Chemists and Metallurgists on "The two modern dragons—bad air and dust." From there she will go to the University of California to deliver two courses of lectures on euthenics and sanitation.

A portrait of the late George Chapman Caldwell, professor of chemistry at Cornell University, has been painted, for presentation to the university by his colleagues and former students. Dr. Andrew D. White made the presentation address and Dean Crane received the portrait on behalf of the university.

A monument in honor of the eminent surgeon Mikulicz, who died in 1905, has been unveiled in Breslau with an address by his successor Professor Küttner.

At a meeting of subscribers to the statue of Lord Kelvin for Belfast, held on June 2, it was resolved unanimously that the statue be erected in the grounds of the city hall instead of in the grounds of Queen's University.

The twenty-sixth annual convention of the American Institute of Electrical Engineers will be held at Frontenac, Thousand Islands, N. Y., from June 28 to July 1, under the presidency of Mr. Louis Ferguson, of Chicago.

The people of Honolulu already have pledged half of the money asked for by the Massachusetts Institute of Technology for the maintenance of an observatory which the institute proposes to establish at the Brink of Kilauea for the study of volcanic action. Professor T. A. Jaggar will spend the summer there.

The department of geology at the University of Michigan has received from Professor Dean C. Worcester, Secretary of the Interior

for the Philippine Islands and at one time a member of the faculty of the university at Ann Arbor, the gift of a unique collection of photographs of the volcanoes in the Philippine Islands. These excellent photographs, more than two hundred in number, have been taken mainly by Professor Worcester himself in connection with his many journeys through the islands, and for the most part are of volcanoes which have never before been photographed. Among them are a considerable number of prints of a volcano 1,600 feet in height, which in 1871 was suddenly thrown up over a fissure in a level plain only 400 yards distant from the town of Catarman on the Island of Camiguin, north of Mindanao.

MR. ZACCHEUS DANIEL, of the Princeton Observatory, discovered a comet June $15^d.80$ Greenwich mean time, in R. A. $1^h\,39^m\,54^s$, Dec. $+28°\,55'$. The comet is visible in a small telescope. "Motion rapidly northerly."

DR. EDWIN B. FROST, director of the Yerkes Observatory and managing editor of the *Astrophysical Journal,* announces that the subscription price of the journal has been increased from four to five dollars. He writes: "It is obvious that a periodical of a strictly scientific character like the *Astrophysical Journal,* even though conducted without expense for contributions or for editorial or clerical assistance, can not be self-supporting. The large number of costly illustrations, which are necessary to properly elucidate the text and to place before the reader as nearly as possible the author's original scientific evidence, constitute a large item of expense, which has been increased very materially of late by concerted action of engravers. The considerable amount of tabular matter accompanying many of the articles also adds largely to the cost. In spite of the use of monotype composition for much of the text, the cost of manufacture has been gradually increasing, in accordance with the general tendency toward higher prices. The point has been reached where a reduction in the size of the journal and in the average number of illustrations must be made, or the subscription price be increased. The annual deficit of the journal has been met by a subsidy from the University of Chicago, which in the last two years has been $2,000. An increase in this subsidy can not be requested. With the advance in subscription price it is expected that the size of the journal and the number of illustrations will be maintained as during recent years. A careful comparison, in respect to amount of text and illustrations, has been made with all the principal contemporaries of the *Astrophysical Journal,* both foreign and domestic. This shows that even after the present advance, the journal will be relatively cheaper than other periodicals of its class."

AN investigation as to the practicability of reforesting the great areas of forest lands which have been devastated by fire and which are now lying barren and unproductive is now being carried on by the United States Forest Service in the Olympic National Forest in Washington. The area selected for the experiments comprises several thousand acres on the Soleduck River, and was at one time covered with a magnificent forest of Douglas fir. It was first burned over in 1890 and again in 1895. A third fire over almost the same area occurred in 1906, destroying the last remnant of the original forest, leaving the entire area treeless. In some regions a second growth of trees will come in naturally after a burn, in the course of a few years time, and where this happens artificial means of securing reproduction is not necessary. There are, however, other burns, where new growth does not come in readily, due to the adverse climatic conditions, absence of seed trees, or perhaps to the impoverishment of the soil by repeated fires. These areas are often of very large extent and in such cases some means, such as planting trees or sowing seed, is necessary to restore the forest. The burn in the Olympic Forest is of this nature and the Forest Service is planning to conduct a series of experiments to determine the proper methods of reforesting the area. Douglas fir will be the species used. It is believed that on the greater part of the area simply scattering the seed over the ground in the fall before the

snow falls or in the early spring will be sufficient to start a new growth. On other portions of the area, however, where a growth of grass and weeds has covered the ground, it will probably be necessary to work the seed into the soil by raking or dragging brush over the ground. In some localities sowing by what is called the seed spot method in which several seeds are dropped together in spots and covered with soil will probably be successful. To test these various methods five experimental plots have been selected. These represent the various conditions found on the burn, such as difference in slope, altitude, exposure and vegetation. This fall a large quantity of Douglas fir seed will be collected and a quantity sown on each plot. Next spring the experiments will be repeated and it is expected that the results obtained will indicate what methods and what seasons of the year are best adapted to the conditions found on this burn. When this is accomplished the Forest Service will be in a position to commence the reforestation of the Soleduck burn on a large scale and to reseed large areas each year. It is believed also that the results obtained will be of value not only in solving the problem of restocking the burn in the Olympic National Forest, but that much will be learned concerning the best methods of reforesting denuded areas in other forests throughout the Pacific northwest, where conditions are similar, and that thus the work may be largely extended.

UNIVERSITY AND EDUCATIONAL NEWS

The University of Wisconsin, the University of Michigan, the University of Minnesota and the University of Toronto have been admitted to the regular pension system of the Carnegie Foundation for the Advancement of Teaching.

Mr. John D. Archbold has given $300,000 to Syracuse University, to pay the mortgage on the ground of the university which was placed in order to build the gymnasium.

Swarthmore College will receive $125,000 from the General Educational Board, providing the sum of $375,000 is raised within two years by the college. The sum of $187,500 has already been subscribed.

Dr. C. T. Williams, of Pembroke College, has given £2,500 to Oxford University for scholarships in physiology and human anatomy.

The School of Mining affiliated with Queen's University in Kingston, Ont., is about to erect a new chemical building which will cost nearly one hundred thousand dollars and will probably be ready for occupation in October, 1910. In the meantime, indeed very soon, two or three appointments to the teaching staff will be made. A building for mining and metallurgy will also be put up at a probable cost of fifty thousand dollars. It is the gift of a member of the staff of the school, Professor Nicol, of the department of mineralogy. The chemical building is provided by the Ontario government.

The department of zoology and geology at the Massachusetts Agricultural College will this year conduct a ten days' camp at the seashore for introductory work in marine zoology. The camp will be established at Groton, Connecticut, at the mouth of the Poquonnock River. Work will begin at the close of the college year. The department thus aims to supplement its courses in general and economic zoology. The work will consist mainly in the study of habits, habitats and ecological problems, in collecting for study, dissection and preservation and in photographic work. The privileges of the excursion are open to students of elective undergraduate courses. Reports will be required and credit will be given for the work as a part of the undergraduate courses. The work will be in charge of Professor C. E. Gordon.

The Rev. Henry H. Appel, of York, has been elected president of Franklin and Marshall College, at Lancaster, Pa. Mr. Appel is a son of the late Thomas G. Appel, who was president of the college for many years.

Dr. Harold Pender, of New York City, has been appointed professor of electrical engineering in the Massachusetts Institute of Technology.

OSCAR A. JOHANNSEN, assistant professor of civil engineering at Cornell University and author of researches on the biology of water supply, has accepted the professorship of entomology in the University of Maine.

DR. J. E. KIRKWOOD, formerly an investigator with the Continental-Mexican Rubber Company in Mexico, has been appointed assistant professor of forestry and botany in the University of Montana.

CHAS. H. TAYLOR, a graduate student in geology at the University of Chicago, has been appointed assistant professor of geology in the University of Oklahoma.

PROFESSOR H. A. WILSON, F.R.S., of King's College, London, has accepted the appointment of professor of physics in McGill University.

DR. ARTHUR LAPWORTH has been appointed a senior lecturer in chemistry at the University of Manchester. He is the son of Dr. Lapworth, F.R.S., professor of geology at Birmingham, and is at present head of the chemical department of the Goldsmiths' Institute, New-cross.

DISCUSSION AND CORRESPONDENCE

MYLOSTOMID DENTAL PLATES

IN a recent contribution by Dr. L. Hussakof on "Relationships of American Arthrodires" (*Bull. Amer. Mus. Nat. Hist.*, 26, art. 20), a peculiar dental element is made known under the caption of *Dinognathus ferox*. The designation applies to a supposed new genus and species of Arthrodires, of doubtful family relations, and whose characters are imperfectly definable. The position of the plate in the mouth is held to be indeterminate, although remark is made that "its form is not suggestive of having been set in a titanichthid mandible."

Knowledge of this unique structure is the more welcome, since, as the present writer believes, it dispels the mystery of the missing upper dentition of *Mylostoma terrelli* Newb. That the peculiar plate in question belongs to the same sort of creature, if not indeed to the identical species as that established by Newberry upon the evidence of a solitary mandibular plate (now the property of the Museum of Comparative Zoology), seems practically certain. At all events it can be provisionally associated with the type of *M. terrelli* with the same confidence that actuated Newberry's theoretical correlation of upper and lower dental plates of *M. variabile*—an hypothesis afterwards confirmed beyond peradventure by Bashford Dean.

The mylostomid nature of the novel dental plate under discussion is unmistakable, one might even say self-evident, the moment it is perceived to be a compound instead of simple element, representing in its entirety the forwardly placed pair of palato-pterygoid dental plates common to Arthrodires and Ctenodipterines. Among the latter, *Heliodus lesleyi* furnishes an analogous instance of fusion of the corresponding parts.

The newly discovered dental plate is significant for yet another reason, namely, for enlightening us as to the extent to which the components of the upper dentition of Arthrodires are capable of fusion *inter se*. Certainly in *Dinomylostoma*, and presumably, also, in *Mylostoma* proper, there is a single pair of vomerine, and two distinct pairs of palato-pterygoid dental plates. In Dinichthyids, so far as known, the two last-named pairs on either side are fused into a single "maxillary" element or "shear-tooth." *Dinognathus* is peculiar in having the forward pair of palato-pterygoid tritors fused into a single plate, whose periphery accords fairly well with the antero-external contour of the mandible—that is, on the assumption that Newberry's so-called *M. terrelli* and the newly described *Dinognathus ferox* relate merely to different parts of the same dental apparatus. It is pertinent to observe further that a rounded eminence occurs in the median line anteriorly, as shown in Dr. Hussakof's figure, corresponding in size and position to surface elevations of the homologous plates in *M. variabile*. The manner in which these eminences interact with depressions in the functional surface of the lower dentition has been discussed elsewhere. As to the occurrence of vomerine teeth and a

posterior pair of palato-pterygoid dental plates in the new genus described by Dr. Hussakof we are still without information, but the presence of the latter, at least, may be predicated as a logical necessity.

Newberry's recognition of *M. terrelli* as a distinct species is justified by appreciable differences between the mandible upon which it was founded and those characterized by him as *M. variabile*. Generic differences between it and other Mylostomids are now indicated by the characters of its (supposed) upper dental pavement. Hence, in order to give effectiveness to the theoretical association of parts here proposed, it becomes necessary first of all to unite the two "species" of *ferox* and *terrelli;* and secondly, to substitute the latter specific title, on grounds of priority, as genotype of *Dinognathus*.

C. R. Eastman
Harvard University

A LAWYER ON THE NOMENCLATURE QUESTION

Discussions of the past year or two in scientific journals—more particularly in Science—move the undersigned to free his mind on the above subject. Trained first as a zoologist and later as a lawyer, he now follows law as his vocation and zoology as his avocation. This is a good combination of schoolings for the appreciation of some aspects of the nomenclature question.

In the first place, nomenclature as an art—and it is already an art and a very specialized one at that—is not science at all, but law pure and simple. It is the art of interpreting and applying to various states of natural fact the unnatural man-made rules which have grown up during the last century and a half, partly by unwritten custom, partly by precedents, and partly by conscious legislation, just exactly as other systems of law have grown up. Doubtless it is because the scientific men who handle this body of law have no legal training and try to handle it as if it were science (as some undoubtedly suppose it to be) that they make such a prodigious bungle of it. Their chief blunder is that they endeavor to carry on and administer and build up this system of law *without any courts!* Consequently every piece of litigation (conducted most uneconomically and unsystematically by loose correspondence and articles in scientific journals which ought to be reserved for better things) is indeterminate and each litigant remains of the same opinion still and acts accordingly. If merchants and business men were so stupid as to try to administer the complicated rules of their game for themselves, to the ruinous neglect of their real interests, without special training in the making and interpreting of rules, and *without tribunals for the settlement of their questions,* we should have an exact parallel to the situation which has arisen in zoology and botany.

Some may doubt my dictum that the field of nomenclature is a field of law, not science. Let me add to this dictum one to the effect that many, if not most, of the questions of nomenclature (like many questions of law) are of utterly insignificant importance so only that they be settled *one way or the other, quickly, definitely* and *permanently*. Then let me cite an instance—and a fair one too—illustrative of both dicta.

Picking up the April number of the *Proceedings of the Malacological Society of London,* I see that A. J. Jukes-Brown, a competent authority in the malacological world, differs widely and strenuously, though courteously, from our own Dr. Dall (a highly competent authority) as to the nomenclature of certain groups of the Veneridæ. In part his difference turns on different findings and interpretations of facts. These are scientific differences. The scientific methods of which each is master will enable the two men to agree—or if they can not reach the same conclusion then to agree to differ. Neither can, or should, after his final reexamination of the evidence, yield his honest opinion a jot to anybody or to any tribunal. But in part his difference turns on the following point. Dr. Paul Fischer, in his "Manuel de Conchyliologie" (etc.), did much rearranging and collating of generic and subgeneric groups. For each group he had the habit of naming one species with the prefix "*ex.,*" standing, of course, for "example." Dr. Dall, perhaps not

unnaturally considering it as of little significance whether the species selected as illustrative of a group was called "the type" or "the example" of it, regarded Fischer in these cases as having designated the type with the usual train of consequences under the rules. Jukes-Brown holds that of course Fischer did nothing of the kind, examples not necessarily being types.

I should be willing to argue either side of this if paid for it—but not otherwise! It is a law-point pure and simple and a dry one at that. It is not of the very smallest import to any aspect of science which way it is decided. To flip a coin would be a good way to settle it. Yet in the present state of things it is quite supposable that Dr. Dall and Mr. Jukes-Brown, in order to reach a working agreement as to the nomenclature of the Veneridæ which *is* of scientific import, may feel compelled to give considerable amounts of their time, and considerable space in a crowded journal, to a necessarily inconclusive attempt to thresh it out.

It is a sin and a shame, a reproach to science and scientific men, that the time of master specialists, every available moment of which is needed by science, should be taken up by utterly vain questions like this, which any whipper-snapper just out of a law school could actually handle better than they can because trained for it and not taking it so much in earnest. And their time *is* taken up by questions like this, and it *has* to be under the present lack of system.

And what, pray, is the great difficulty in settling these things as they should be settled? If the next International Zoological Congress voted to establish an international court of five members sitting for three months annually to decide in writing every question submitted, with or without argument, taking counsel with specialists when necessary, publishing its decisions in an annual volume with or without the course of reasoning in each case, how many years would it take before the *main* questions were *all settled* and the business of the court reduced to a thin trickle of new puzzles? Of course such a court should have absolute power to settle absolutely everything nomenclatorial except questions of natural fact and scientific interpretation. Equally of course it would have to treat the priority rule as a *prima facie* rule made by sane men for sane men, not as the superstition and incubus it has become. If they saw fit to rule *in* one auction catalogue as a nomenclatorial source for merely practical reasons, and rule *out* another for similar reasons, they should have a free hand to do so without feeling that any one by being the first to name, or perhaps mis-name, a natural object thereby acquired a vested right to retard the progress of science for centuries. Of course in the present absence of such a tribunal, or of *any* tribunal, an absolute priority rule has an excuse as being the nearest present approach to a universal touchstone for our names, and so long as that situation endures systematists are bound to live strictly up to it. But with such a tribunal suggested the direful necessity for it would pass away, and the "Museum Smithianum," 1832, having once been ruled in we could then apply its names and learn them without the probability of someone's discovering next year that the "Museum Jonesianum" —date hitherto unknown—was in fact published in 1831. Nay more, a discovery that the "Museum Smithianum" was a rank forgery and in large part non-binomial need not worry us. Once ruled in or out, mistakenly or not, it stays so. The name "*Octopus*" once adjudicated to be the name of the group typified by *O. vulgaris* L. stays so no matter how clear the proof that the court ought by every known rule to have made it "*Polypus*." Is there any ethical question involved? No. And does it matter to science which it is called? Not an iota so long as we know which.

Would it not tend to "crystallize" and "fossilize" science? No, but it would tend to crystallize and fossilize the artificial Latin nomenclature of science which *ought* to be crystallized and fossilized, and the sooner the better. Of course no tribunal can ever pass on the question whether a given form is a variety, a subspecies or a species; whether it belongs to this or to that genus or subgenus; what are the limits of a family; *nor on any*

other question of science properly so called. And equally of course nomenclature can never be definitely settled. But its puerile and yet forbidding aspect can be vastly altered for the better.

Is there any real practical difficulty in the way of doing all I have suggested and doing it at once? Emphatically *no*! Men more trained to cooperation than scientific men—business men, administrators, lawyers, politicians—would have done it long ago.

Francis N. Balch

Jamaica Plain,
May 21, 1909

PERSONAL NAMES AND NOMENCLATURE

The use of personal names in nomenclature which has been somewhat criticized by various correspondents is perhaps defensible under certain circumstances. While its objections in many instances have been pointed out yet the absurdity of the practise becomes strikingly apparent when one notes such a paper as that on Paleozoic Ostracods in a recent volume of the Proceedings of the National Museum. In all, sixteen generic names are used in the article; nine of these are old and seven new. Among the old names, five are certainly personal in origin, four may not be, although two of these probably are. Among the seven new names, absolutely every one is personal. Either this indicates an extraordinary number of distinguished men in this field or an unfortunate lack of mental energy on the part of the authors.

X

SIR WILLIAM GAIRDNER'S PAPERS

To the Editor of Science: In response to the wishes of Lady Gairdner and her family, I have undertaken to edit the medical and scientific papers and articles of the late Sir William Tennant Gairdner, and to preface the collection with a biography.

In order to render the work as worthy as possible of the memory of the late professor, I am desirous of enlisting the sympathy and help of his friends. I venture therefore to request through your columns that any one who has in his possession any letters or other literary remains of Sir William Gairdner will be so kind as to communicate with me.

G. A. Gibson

3 Drumsheugh Gardens,
Edinburgh,
May 12, 1909

SCIENTIFIC BOOKS

The Book of Wheat. By Peter Tracy Dondlinger, Ph.D., formerly Professor of Mathematics in Fairmount College. With 60 illustrations. Pp. xi + 369. New York, Orange Judd Company; London, Kegan Paul, Trench, Trübner & Co., Limited. 1908.

When we think of the great importance of the cereal wheat in the food economy of nations it is surprising that there has not been more written on the subject. The book now before us is something that might well have been looked for years ago. The author has furnished portions of his manuscript at different times to the writer of this review, and the latter has, therefore, known something of what was to be expected in the book itself.

Naturally a writer is likely to give more prominence, in discussing a subject, to those features with which he has come most often in daily contact, and so in this instance there is proportionately not as much space given to the discussion of wheat as a plant as to the milling operations, the commercial and economical position, etc. The work is particularly lacking in its presentation of wheat classification, discussion of varieties and other matters of botanical and agronomic interest. On the other hand, there is a very full discussion of the machinery for harvesting and threshing, crop rotations, fertilizers, marketing, milling, prices, movement and consumption. A commendable feature, also, is the addition of a very complete bibliography, though it must be said that the proofreading of this bibliography was very faulty.

Considerable attention is also properly given to the topic of diseases and insect enemies.

In making use of the map (page 9) showing wheat distribution, which was formerly published by the U. S. Department of Agricul-

ture, it is unfortunate that the author did not so change it, in accordance with the suggestion of the writer, as to put the durum wheat district in its correct position. This area, however, is properly shown in another map on page 48. Not long after the publication of the first map by the U. S. Department of Agriculture events occurred in the establishment of durum wheat which greatly changed the boundaries of the district.

Because of the lack of special observation and training in particular lines the author is led into making a few peculiar statements, some of which are not well founded; for example, the statement on page 48: "Common bread wheats are usually grown on black soils. These soils are not well adapted to fall wheat, however, for it is apt to winterkill." There is no good reason for this statement, with the possible exception that black soils are often heavy and therefore apt to bake and crack open, thereby exposing the crown and roots to the winter's cold, but even then rolling the ground is a simple remedy. As a matter of fact, winter wheat is very commonly grown on just such soils.

Also, on page 51, it is not clear why the author should say: "Winter wheat may be sown in spring and spring wheat in the fall. Only a very few plants will ripen seed, but when this is continuously sown, *in three years the spring variety will be changed to the winter, and vice versa.*" (Italics are the reviewers.) There are only certain varieties, already on the border of these two groups, that we are yet certain can be thus changed at all, and even these are likely to require much more than three years to become completely adaptable in the other group.

There is a slight inaccuracy in the first paragraph on page 56, which, however, in this case is rather important, as it refers to the introduction of the present hard winter wheat, called here "red winter wheat," from Russia into Kansas. The Department of Agriculture did not, as there mentioned, originally introduce the wheat, but later took active part in extending the area by further importations; it appears that Russian Mennonites first brought the wheat to Kansas.

On pages 121 and 122, after describing the extensive immigration into the Great Plains region and the rapid settlement of that area, saying: "The 'Great American Desert' disappeared from the maps," and "During a series of years in which the rainfall was more adequate than usual, the agricultural areas leaped forward to the west from county to county," the reader is suddenly brought against a fall of cold water by the statement that "Yet the blunt fact remained, and still remains, that many millions of acres were dead, vacant, and profitless simply because of their aridity. This land has little value now, for in many places a whole section does not yield enough to keep a fleet-footed sheep from starving." Without any question much has been said that is extreme on both sides of this question of just how profitable may be the cultivation of these semiarid lands, but doubtless there is a sane, medium ground to be taken. It is certain that, as a rule, much more may be produced than is sufficient "to keep a fleet-footed sheep from starving," but, on the other hand, the proper cultivation of such districts is in no way child's play. No doubt fair average results can be obtained, but the farming must be done by the most intelligent, up-to-date methods.

Under the discussion of milling operations we have, on page 272, the same old diagram of a large flour mill which has been used in various other publications, but which would not be at all an accurate presentation of our present-day, improved mills.

After these statements of some imperfections, of which it must be admitted there do not seem to be many, the author is to be commended for the ample presentation he makes of certain phases of wheat handling, giving a particularly full discussion of the marketing, price and movement of wheat, including dealings on boards of trade, speculation, grain privileges, delivery, etc. There is considerable discussion, also, of storage, grain elevators, the method of bagging on the Pacific Coast, etc.

The book is rather fully illustrated, particularly along commercial lines. It is a book that will be extremely useful not only to busi-

ness men but as a reference work in schools and colleges.

Mark Alfred Carleton
U. S. Department of Agriculture

BOTANICAL NOTES

GENERAL NOTES

One of the most interesting of the popular bulletins issued by the United States Department of Agriculture is that on "The Basket Willow" (Farmers' Bulletin 34) prepared by W. F. Hubbard, of the Forest Service. It appears that the growing of basket willows was introduced into the United States about sixty years ago by German immigrants who settled in New York and Pennsylvania. It has now extended south and west and is rapidly spreading over the non-arid regions of the far west. Three species are commonly grown for this purpose, viz., *Salix amygdalina, S. purpurea* and *S. pruinosa acutifolia,* and in the bulletin the peculiarities of each are given. How to plant, how to prune and care for the young trees, how to cut and peel the rods, and finally how to prepare them for the market are described in a most interesting manner. Every botanist who is interested in the economic aspects of his science will find this pamphlet worth reading.

Botanists of an ecological turn of mind will find in A. W. Sampson's paper on "The Revegetation of Over-grazed Range Areas" (Circular 158, U. S. Forest Service) an example of how ecology may have some intensely practical applications. In the Wallowa National Forest in northeastern Oregon the sheep owners overgrazed the land, and it became necessary to study the problem of the restoration of the pastures to their original condition. At first this would seem to be an agricultural problem, but its solution called for "an expert in plant ecology (Mr. Sampson) and in the last analysis the problem becomes an ecological one. The paper is commended to ecologists for careful study.

Another agricultural bulletin of high botanical interest is L. H. Smith's on "The Effect of Selection upon Certain Physical Characters of the Corn Plant" (Bull. 132, Ill. Expt. Station) in which are given the results of experiments in breeding corn (maize) with reference to (1) the height of the stalk, and (2) the declination of the ear from the stalk. By starting with a particular variety of corn and breeeding in opposite directions in the fifth generation the average heights of the ears on the stalks are three feet apart. In part this is due to the increased height of the whole plant on one hand, and the decreased height on the other, but it is due still more to the appearance of the ears from higher or lower internodes. Thus the average number of internodes below the high-eared corn was $8\frac{1}{2}$, while the average for the low-eared corn was $6\frac{1}{2}$, and this was reduced to a little more than $4\frac{1}{2}$ in the last generation. Apparently one may breed the ears down to the ground, or up out of reach.

Here may be mentioned W. T. Macoun's "List of Herbaceous Perennials Tested in the Arboretum and Botanic Garden of the Central Experimental Farm at Ottawa, Canada," which contains an astonishingly large number of species (over 2,100), when one thinks of how far north they were grown.

Under the title "The Distribution of Woody Plants in the Pikes Peak Region" Professor E. C. Schneider enumerates 115 species, giving altitudes, distribution and descriptive notes. It is printed in the Colorado College Publication (Vol. XII., Science Series). Fifteeen conifers are enumerated, five poplars, fourteen willows, six oaks, etc.

Much more ecological in nature is Professor Ramaley's "Studies in Lake and Streamside Vegetation" (*Univ. Colo. Studies,* Vol. VI.), which deals with the plants of Redrock Lake near Ward, Colo., at an altitude of over 10,000 feet above sea-level. It is, we are told, the first of a series of similar papers. It is beautifully illustrated by many half-tone reproductions of photographs.

That the botanists of Colorado are active is shown by the foregoing, and also by the following titles of recent papers in the *University of Colorado Studies* (Vol. VI.): "Botanical Opportunity in Colorado," by Professor Ramaley; "Studies in Mesa and Foothill Vegetation" (including the "Distribution of Conifers (4 species only) on the Mesas," by-

W. W. Robbins and G. S. Dodds, and "Distribution of Deciduous Trees and Shrubs on the Mesas," by W. W. Robbins); and "Bibliography and History of Colorado Botany," by Edith M. Allison. Under the last title several hundred papers are enumerated bearing more or less upon Colorado botany.

Somewhat out of the ordinary is Professor De Loach's bulletin entitled "The Mendelian and De Vriesian Laws Applied to Cotton Breeding" (Bull. 83, Georgia Experiment Station). It is a plea for the application of scientific principles to the breeding of the cotton plant, with illustrations from his own work, and will repay careful reading.

The Report of the State Forester of Wisconsin for 1907 and 1908 contains much interesting, and some encouraging matter for the lover of forests. Especially pleasing is the "half-tone" frontispiece which shows a thrifty growth of young pines which if protected will eventually restock the land with a forest covering.

Not strictly botanical, but worthy of examination, is the Second Biennial Report of the Wyoming State Board of Horticulture, of which the well-known botanist, Professor Aven Nelson, is the secretary. The eastern reader will be astonished at the photographs of fine trees and fruits grown in this new mountain state.

RECENT SYSTEMATIC PAPERS

Another local manual of botany has appeared, this time in a region where such a thing is much needed. Professor J. R. Watson, of the University of New Mexico, has issued as one of the bulletins of the university (No. 49) a pamphlet of a little more than a hundred pages consisting of a "Manual of the More Common Flowering Plants Growing without Cultivation in Bernalillo County, New Mexico." In his preface the author says that it "has grown out of the need of a key to the local plants to place in the hands of his students. None of the manuals published cover this region satisfactorily." Thus finding no systematic manual, he very properly went to work and made one. That is the right spirit for the teacher, and Professor Watson is to be commended for undertaking the work. And we say this in spite of the poor printing and the numerous typographical errors in the pamphlet. One who has had no experience with the small printing establishments to be found away from the large cities has no conception of the impossibility of faultless typography under such circumstances. So we overlook the *form* of the little manual, and see in it a worthy effort of the author to supply a usable book for his pupils. We should like to see more teachers willing to incur the labor necessary to provide as useful a book as this.

H. Leveille's "Monographie du Genre Onothera," begun some years ago, has reached its third part and includes species from No. 38 to 54, *i. e.*, those of the "groups" *Godetia, Clarkia* and *Boisduvalia.*

Recent numbers of the "Leaflets of Philippine Botany" issued at irregular intervals by A. D. E. Elmer, of Manila, include articles 23 (November 23, 1908) to 29 (February 15, 1909). The titles are "Synopsis of *Rubus*" (classifying and describing the sixteen species and one variety which occur on the island), "Threescore of New Plants," "The Genus *Itea*" (containing two Philippine species), "A Fascicle of South Negros Figs" (34 species, of which 5 are new), "Gesneraceæ from the Cuernos Mountains," "New Philippine Zingiberaceæ" and "A Score of New Plants." These "leaflets" constitute an interesting little journal of systematic botany.

A NEW LAKESIDE LABORATORY

A very pretty prospectus announces the establishment of the "Lakeside Laboratory" of the State University of Iowa at Okoboji, Iowa, by the alumni of that institution. The location is on a bay on the westerly side of Okoboji Lake, in the extreme northern part of central Iowa, at the highest elevation above the sea of any place in the state. The session covers ten weeks, divided into two terms, the first from June 21 to July 31, and the second from August 2 to August 28. In botany three courses are offered in the first term, namely: (1) mycology, by Professor Macbride; (2)

biology of aquatic plants, by Professor Wylie; (3) the nature of plants, by Professor Wylie. Opportunities are afforded, also, for research work in botany under the direction of the two professors named. In the second term, work is offered in field ecology and plant taxonomy by Professor Shimek. Courses in geology, zoology and nature study also are offered by competent instructors. The management of this summer-school work is in charge of the director of university extension at Iowa City.

Charles E. Bessey
The University of Nebraska

SPECIAL ARTICLES

SEX AND ITS RELATION TO THE BARRING FACTOR IN POULTRY

W. J. Spillman[1] has suggested that the barring factor and sex in poultry are correlated in such a way that the female is always heterozygous in respect to sex and also barring when present. The male, on the other hand, is always homozygous in respect to sex and may be either homozygous or heterozygous in respect to barring. I have recently performed the following experiments, which bear directly on this point and confirm his theoretical deductions.

Experiment 1.—A Buff Rock male (non-barred) bred to Barred Rock females give, in F_1, barred males and non-barred (blacks or buff) females.

Experiment 2.—A Barred Rock male bred to Buff Rock females (non-barred) or a Rhode Island Red female (non-barred) gives in F_1, all barred birds in both sexes.

Experiment 3.—A Buff Rock male bred to F_1 females (non-barred) from experiment 1 gives, in F_2, chicks which do not show the down pattern characteristic of chicks from barred parents, thus indicating an entire absence of barring in F_2.

These experiments may be formulated thus: Using B = barring factor, b = its absence; F = the female sex factor, f = its absence or the male sex factor. Assume that B and F can not occur in the same gamete (Spillman). Then,

Experiment 1 becomes $bf \cdot bf \times Bf \cdot bF = Bf \cdot bf + bf \cdot bF$.

Experiment 2 becomes $Bf \cdot Bf \times bf \cdot bF = Bf \cdot bf + Bf \cdot bF$.

Experiment 3 becomes $bf \cdot bf \times bf \cdot bF = bf \cdot bf + bf \cdot bF$.

Other crosses giving similar results are:

Experiment 4.—A White Rock male (carrying barring as a cryptomere) mated with Brown Leghorn females gives in F_1 both sexes barred.

Experiment 5.—The reciprocal cross, viz., a Brown Leghorn male mated with White Rock females gives black chicks and chicks having a down pattern like that of Barred Rock chicks. These chicks, however, are yet too young to enable a determination of their sex.

Experiment 6.—A White Rock male (carrying barring) bred to Buff Rock females gives, in F_1, both sexes barred.

Experiment 7.—From the reciprocal cross I have only two birds as yet, both barred males.

Experiment 8.—One of the F_1 barred males from experiment 7 mated with a Buff Rock female gives, in F_2, barred and non-barred chicks, which are still too young to permit of their sex being determined.

While my results appear to confirm Spillman's suggestion, I wish to point out that experiment 3, rather than experiment 2, 4, 6 or 8, furnishes us the true test of his suggestion, for the reason that the presence of the F factor may simply prevent the B factor from becoming visible under certain conditions. In some experiments, at any rate, I find that the presence of the F factor operates to modify barring, making it appear obscure and blurred as compared with males from the same parents. On the other hand, we may refer this obscuring of barring to some other cause, perhaps the heterozygous nature of the female.

The details of these experiments are reserved for a later paper.

H. D. Goodale

Since the above note went to Science some F_2 chicks in experiment 3, have reached the

[1] *Am. Nat.*, Vol. XLII., No. 50, 1908.

stage at which barred chicks usually exhibit distinct barring in their first feathers. Such barring is absent in these F_2 chicks.

THE TENTH ANNUAL MEETING OF THE SOCIETY OF AMERICAN BACTERIOLOGISTS HELD AT BALTIMORE, MD., DECEMBER 29–31, 1908

THE tenth annual meeting of the Society of American Bacteriologists was held in the rooms of the laboratories of pathology and of physiology of the Johns Hopkins University and Hospital, Baltimore, Md., on December 29, 30 and 31, 1908.

Professor H. L. Russell, of the University of Wisconsin, president of the society, occupied the chair.

The scientific program consisted of thirty-two papers, all of which aroused much interest; certain of them are reproduced in abstract below. The society also met in joint session with Section K of the American Association for the Advancement of Science on December 30, when a paper on "Anaphylaxis" was read by one of its members, Dr. M. J. Rosenau, of Washington, D. C.

About fifty-two persons were in daily attendance at the several sessions of the society.

During the sessions the following matters of business were transacted: Dr. William H. Welch, of Baltimore, was reelected to represent the society on the council of the American Association for the Advancement of Science. To fill the vacancy on the Committee on Methods and Identification of Species, caused by the absence of Professor F. D. Chester, Professor C.-E. A. Winslow, of Boston, was duly elected. Professor Erwin F. Smith, of Washington, D. C., was delegated to represent the society at the approaching meetings of the International Botanical Congress at Brussels in 1910. The question of the society withdrawing its affiliation with the American Association for the Advancement of Science and transferring the same to the American Society of Naturalists and agreeing to meet with the latter body in the future was warmly discussed. It was decided to sever the present relations and join meetings with the naturalists should they decide to meet apart from the American Association for the Advancement of Science.

The following are the names of the officers of the society elected for the year 1909:

President—Dr. J. J. Kinyoun, Washington, D. C.

Vice-president—Dr. Veranus A. Moore, Ithaca, N. Y.

Secretary and Treasurer—Dr. N. MacL. Harris, Chicago, Ill.

Council—Dr. W. W. Ford, Baltimore, Md.; Dr. F. C. Harrison, Macdonald College, Quebec; Dr. H. W. Hill, Minneapolis, Minn.; Mr. Lore A. Rogers, Washington, D. C.

By the election of the following gentlemen, the limit to active membership in the society, as defined by the constitution, has now been reached, namely, 125:

Dr. Burdett L. Arms, assistant director of the bacteriological laboratory of the Board of Health, Boston, Mass.

Dr. John W. Connaway, professor of comparative medicine, and veterinarian in the College of Agriculture, the University of Missouri, Columbia, Mo.

Mr. George E. Gage, assistant in bacteriology, Yale University, New Haven, Conn.

Mr. Daniel D. Jackson, director of the laboratories, Department of Water Supply, Gas and Electricity, New York City.

Dr. Harry T. Marshall, professor of pathology and bacteriology, University of Virginia, Charlottesville, Va.

Dr. Otto Rahn, assistant professor of bacteriology and hygiene, Michigan Agricultural College, East Lansing, Mich.

Mr. James C. Temple, soil bacteriologist, Georgia Agricultural Experiment Station, Experiment, Ga.

ABSTRACTS OF CERTAIN PAPERS

Acid Fermentations of Milk: E. G. HASTINGS and B. W. HAMMER, University of Wisconsin, Madison, Wis.

In milk, butter and cheese are constantly found organisms identical in all important points with those supposed to be characteristic of certain fermented milks, especially the Bulgarian yoghurt. Production of 3–4 per cent. of acid in milk, growth at high temperature characterize the organism. The therapeutic value which has been ascribed by Metchnikoff and others to the fermented milks, such as yoghurt, is probably due to the composition of the milk, rather than to the presence of the peculiar organism. Since opportunity is constantly offered for the alimentary tract to become seeded with the organism, if it finds favorable conditions for growth in the alimentary tract, it should establish itself, no matter how slight the seeding may be, and we should find it in the feces constantly. Massive seedings can only temporarily establish the organism unless the environment is favorable.

Some Factors concerned in the Fixation of Nitrogen by Azotobacter: Conrad Hoffmann and B. W. Hammer, Bacteriological Laboratories, University of Wisconsin, Madison, Wis.

The possibility of employing azotobacter for artificial soil inoculation, as well as the importance of its existence in soil as a nitrogen increaser, are factors which can not be ignored. With these as a basis, the work reported in the paper of the above title was performed. It appears that some fermentable carbohydrate is essential for nitrogen fixation; the same is true with reference to the presence of phosphorus and some base. The influence of (1) varying amounts and kinds of carbohydrates; (2) of varying kinds of phosphates (mono-, di and tri-forms), and (3) of the period of incubation, were all factors which were considered. The employment of the sand slope and the large Petrie dish cultures proved most efficient in securing the maximum development of azotobacter in pure culture.

Persistence of Anthrax Spores in Raw Water: E. G. Hastings, University of Wisconsin, Madison, Wis.

Anthrax spores have been found to persist for eight years in raw pond water. The longest period of persistence in raw water noted previously was five months; in sterile distilled water thirty months. The water was infected by tannery refuse and growth of the anthrax bacillus had taken place before or after the sample was taken from a stagnant pond. It would seem that the supposition expressed by many that the anthrax organism can grow in nature is true.

Synthetic Media for the Isolation of B. coli from Water: Maurice L. Dolt, Brown University, Providence, R. I.

It was found possible to grow *B. coli* on one per cent. solutions of asparagin if 0.2 per cent. of sodium or ammonium phosphate is added. No other of the soluble inorganic salts seemed to serve.

Substances having an asymmetric carbon atom in their molecule and a CHOH group, such as glycerin, ammonium lactate, malic acid, can be substituted for the asparagin. These substances seem to favor the growth of the *B. coli* and to inhibit the growth of other water organisms. It is very likely the presence of this asymmetric carbon atom and the CHOH group in the cholic acid of bile which gives it these same properties.

Every red colony developing on litmus-lactose-agar made up with glycerin, ammonium lactate, or malic acid in addition to ammonium or sodium phosphate was a colony of *B. coli*. On the malic acid plates only red colonies developed and they were all *B. coli*.

The use of these media in water analysis seems most promising. The presence of *B. coli* even in small numbers can be detected by plating large amounts of the water without preliminary enrichment.

The work is at present being extended to the detection and differentiation of *B. typhosus*.

The complete paper is in the *Journal of Infectious Diseases*, 5, 1908, p. 616.

A Synthetic Medium as a Substitute for Loeffler's Blood Serum in the Diagnosis of Diphtheria: F. P. Gorham, Brown University, Providence, R. I.

The proteid-free medium which in the liquid form had been found by Hadley to be favorable for the growth and toxin production of *B. diphtheriæ* was used in combination with agar as a substitute for Loeffler's blood serum. It was as follows:

Glycerin	3.40	parts.
Sodium chloride	0.60	"
Calcium chloride	0.08	"
Magnesium sulphate	0.32	"
Dipotassium phosphate	0.23	"
Ammonium lactate	0.75	"
Ferric phosphate	0.08	"
Glycocoll	0.10	"

Distilled water to make 100 parts, 1.5 per cent. agar, reaction made + 1 with sodium hydrate.

It was found possible to make a diagnosis from swabbings on this medium in less than fifteen hours.

The organisms were of about the same types as on the Loeffler's blood serum, though there was some indication that the granular types were more common on the synthetic medium than on the blood serum.

Note on Roup in Fowls: Philip B. Hadley, Division of Biology, Rhode Island Agricultural Experiment Station.

The present report is based upon the examination of five fowls which died with the characteristic symptoms of "roup." The symptoms and macroscopical pathological appearances were as follows: Onset of disease like simple catarrh; watery exudate from nose and eyes; accumulation of thick mucus or soft, cheesy exudate in orbital sinus, naso-lachrymal canals and palatine space. Walls of mouth cavity and anterior esophagus whitened and necrotic, sometimes punctated with firm, yellowish-white nodules from 1 to 12 mm.

in diameter, and rising from 0.5 to 3 mm. from the surrounding surface; nodules also present in dorsal wall of crop. Esophagus inflamed from crop to proventriculus. Small intestines inflamed and walls thickened, containing mucus mixed with blood. Large intestines usually normal. Ceca inflamed once at necks and once at tips. Liver in two cases contained small white necrotic areas; bile-ducts inflamed and thickened. Kidneys enlarged in one case. Ureters invariably packed with urates, which also fill cloaca. Spleen enlarged in one instance.

The microscopical pathological conditions were studied in fresh preparations, smears and sections. The hard exudate from the orbital sinus was shown to be made up of mucus, coagulated serum and disintegrated cell substance. The soft cheesy matter and the mucus contained numerous epithelial cells, many of which contained coccidia in the schizont or macrogamete stage; these were also found in the free state. Similar bodies were also found in great numbers in the mucus from the naso-lachrymal canals, palatine space, walls of mouth cavity; also from walls of pharynx, anterior and posterior esophagus, dorsal wall of crop, proventriculus, duodenum, bile-ducts, liver, small intestine, large intestine, ceca, contents of cloaca and in the excrement of diseased birds. The encysted stage of the coccidium, which is identical with the organism of "blackhead," was found in the intestines and ceca, but not in the head region.

No bacteriological examinations were made, but it was apparent that the factor, coccidiosis, was sufficient alone to produce nearly all the pathological conditions observed. As "blackhead" is a coccidiosis of the ceca and liver of turkeys, and as "white diarrhea" is a coccidiosis of the ceca, intestines, duodenum and sometimes of the lungs, spleen and liver, of young chicks, so the writer believes that many, and perhaps all, cases of genuine "roup" are instances of coccidiosis of the head region, with or without intestinal complications.

White Diarrhea of Chicks: A Study in Avian Coccidiosis: PHILIP B. HADLEY, Division of Biology, Rhode Island Agricultural Experiment Station.

"White diarrhea" of chicks is a disease affecting the duodenum, small intestines, large intestines, ceca, liver, pancreas, kidneys, spleen and lungs, manifesting itself by inflammation and eventual necrosis of the epithelial, mucosal and submucosal tissues, and terminating fatally in the majority of cases, primarily as the result of damage to the linings of the alimentary tract, and secondarily as the result of bacterial invasion of the tissues together with suspended constructive metabolism. The aim of the present paper is to show the relation of *Coccidium cuniculi* to this disease.

The macroscopical pathological appearances included the following: (1) occasional inflammation of esophagus and proventriculus; (2) inflammation and thickening of walls of duodenum and small intestines; (3) distention and thickening of walls of the cloaca and large intestine; (4) ceca usually inflamed, walls thickened, and containing a hard or soft yellow exudate or "core"; (5) liver usually contained necrotic areas after the thirteenth day of the epidemic; (6) pancreas occasionally greatly enlarged, and having hard cheesy texture; affection of pancreas, liver and duodenum often coincident; (7) lungs frequently congested, containing grayish nodules; (8) heart frequently contained lobular enlargements; (9) kidneys and ovaries enlarged in a few cases; (10) ureters invariably packed with urates (hence the white diarrhea); (11) yolk sac frequently not properly absorbed, yolk stock occasionally inflamed, walls thickened, containing hardened exudate.

These tissues were examined in fresh preparations, smears and sections, and the microscopical pathological appearances were as follows: (1) epithelial cells of the duodenum, intestines and ceca denuded; (2) in these cells, in the mucous cells and also free were many coccidia; (3) coccidia were also found in the large liver cells from necrotic areas, and free in the connective tissue matrix; (4) nodules from lungs revealed marked inflammation and necrosis; epithelium of bronchi and infundibula broken down, and in the cubical and ciliated cells were inclusions which resemble coccidia.

The bodies described above were the schizont or macrogamete stage of *Coccidium cuniculi*, which is also the cause of "blackhead" in turkeys and of some cases of so-called "roup." This stage of the *Coccidium* is probably identical with the *Amœba meleagridis* described by Theobald Smith in 1896. In the present epidemic no permanent cysts were found in birds under one month old. It is thus indicated that the original infection passes at once into the endogenous cycle of development which is maintained for some time before the exogenous cycle appears. The crisis of the

disease is coincident with the formation of the sexual products. The highest daily mortality was reached when the chicks were eleven days old. One month after the beginning of the epidemic 394 chicks had died out of 510. The *Bacterium septicemiæ gallinarum* of Rettger was not found in connection with the present epidemic.

Some Experiences Relevant to the Determination of the Bacterial Content of Milk: Charles E. Marshall, Director, Michigan Agricultural College, East Lansing, Mich.

It is assumed from the observations in the (*a*) Association Studies conducted by the author and Miss Farrand, in the (*b*) Butter Studies conducted by W. S. Sayer, Otto Rahn and Miss Bell Farrand and in the (*c*) systematic work performed by Miss Zae Northrup, all in the bacteriological laboratory of the Michigan Agricultural College, that:

1. Milks vary in their bacterial content as to both (*a*) numbers and (*b*) species.

2. This variation is dependent upon the (*a*) source of the milk, (*b*) method of milking, (*c*) cleanliness in handling, (*d*) temperature maintained, (*e*) etc.

3. Milks in the light of the above can not develop their germ content (*a*) with the same rapidity or (*b*) in the same relative manner, and therefore can not respond *alike* to even ideal or perfect methods of testing.

4. Methods of testing are only incidental to the real problem; they should be employed to indicate and assist in control.

5. While composition of media, means of dilution, time of plating, temperature for plate development and other factors are highly important in the execution of these tests, the most essential factor at this time is uniformity of methods that the variable minor discordant elements may to a large extent counteract each other through the accumulation of evidence.

6. It follows that the purpose of the Committee on Standard Methods of Bacterial Milk Analysis is justified, even though many of its detailed decisions are arbitrary and perhaps unwarranted should uniformity of methods be established.

7. However, much would be sacrificed if laboratory men forgot the real purport of such analyses and used them simply to estimate the milk per se instead of the conditions which are indicated by such analyses.

It is suggested that perhaps more rapid progress would be made and more enduring results secured were the energies of workers devoted to more exhaustive elemental studies which will assist in the solution of some of these problems.

Cremating Furnace for Laboratories: Charles E. Marshall.

It consists of an open brick chimney, lined with fire brick on the inner wall, and with an air space between the inner and outer walls. At the bottom of the chimney are the cremating apartment, the fire box and the ash pit. The essential and valuable feature of the cremating chimney is the using of gas pipes for grates to support the material, thus enabling the placing of a fire below. These pipes are so inserted in collars communicating with the air outside that a cold current of air passes through when heated and passes into the chimney at the inner end of the pipes which rest on a ledge on the inner wall of the chimney.

Published by the Experiment Station Report of the Michigan Agricultural College for 1908.

Preparation of a Standard Solution of Litmus: Chas. W. Brown, Michigan Agricultural College, East Lansing, Mich.

It was found that 2.5 grams of azolitmin dissolved in one hundred cubic centimeters of distilled water would give a solution of such strength that one cubic centimeter when added to one hundred cubic centimeters of milk would give a blue color of the intensity desired for litmus media. With this as a measure, thirteen samples of litmus were standardized, giving the numbers recorded in the table.

Sample	Grams Required to make 100 c.c. of Standard Solution	Per Cent. Insoluble
Azolitmin	2.5	0
Merck's purified	7	2.3
Soluble litmus	8	14.5
Litmus cubes	140	87.1
No. 1	15	44.3
No. 2	32	68.7
No. 3	68	81.4
No. 4	98	89.4
No. 5	128	92.8
No. 6	164	92.8
No. 7	110	91.5
No. 8	154	94.3
No. 9	146	91.7
No. 10	122	91.8

A definite amount of the sample was weighed out and dissolved in a definite volume of distilled water, either by placing in an incubator at 37.5° C. over night or by heating in flowing steam for thirty minutes. The filtrate was compared in Nessler's tubes with the standard solution

(2.5 grs. of azolitmin in 100 c.c. water) diluted one to five thousand—one or two drops of decinormal potassium hydrate was added to each Nessler's tube to bring out the color. From this comparison the number of grams required to make one thousand cubic centimeters of a standard was interpreted.

Variation in the Acidity of Fresh Milk: W. M. ESTEN, Storrs Agricultural Experiment Station, Storrs, Conn.

The extreme variation, of a herd of 26 cows, covering a period of seven months, was from .075 to .23 per cent. The samples of milk were taken about every fortnight. The method of testing the acidity was by titration with $\frac{1}{10}$ normal NaOH, using 17.6 c.c. of milk and dividing the amount of tenth normal by 20. This result gives the per cent. of acidity in terms of the lactic acid molecule. The samples of milk were collected from each cow in the morning from 5 to 6 and were titrated about 10 A.M. In the interval, after a vigorous shaking, 2 c.c. of milk were taken from each sample for the bacteriological test. The experiments commenced on May 16 and extended to December 16. When curves were plotted and drawn for each cow, for different breeds of cows, for averages of breeds and for all the cows collectively, it was discovered that individual cows varied in their own curve and from the curves of the other cows, and that the breeds markedly varied from one another. There was also indicated for every cow a marked decrease in acidity during the summer, and a marked increase during the winter months. The food and seasonal period seemed to be controlling factors in the variation. The eleven Jerseys had an average acidity of .18 per cent., while the Holsteins had an average acidity of .16 per cent. The individual Jerseys showed a larger variation than the individual Holsteins, indicating that the Jerseys are more susceptible to changes and have a more sensitive nervous temperament. The total average of 378 tests on 25 cows was precisely .17 per cent., a value which gives a fairly correct idea of the normal acidity of milk.

Some of the most marked variations in acidity were found among the Jerseys and one Guernsey. One Jersey had an acidity of .13 per cent. at the close of her lactation period and commenced the next with an acidity of .2275 per cent. Three other Jersey cows had acidities of .22, .225 and .23, respectively, as their highest extremes. These cows were apparently in perfect health. It was found that pathological conditions had an effect on the variation of acidity instanced during the summer by a cow with a sore foot. This cow's milk showed a drop to .125 on July 8, a rise to .18 on July 27 and a drop to .135 on August 7. After her recovery her milk acidity rose to .19 and varied afterwards but little. All these results lead to the conclusion that certain factors of food, conditions of health and the change of seasons have their effects, which are shown in the changes of acidity in the milk. A Guernsey had the most remarkable variation of all. Her average was only .108 with variations from .075 to .13. This is the lowest extreme in acidity that has, to the writer's knowledge, been recorded.

The question arises, What are the neutralization elements which we call acidity of milk? Is it the caseinogen alone, or caseinogen combined with other compounds, that causes the reactions? It has been suggested that the amount of acidity is an indirect indicator of the amount of caseinogen present. If this be true the acidity test would be a simple and rapid determination for the approximate amount of caseinogen present. It is to the chemist that we must submit the problem for solution.

Cost of Heating an Incubator with Electricity: W. M. ESTEN, Storrs Agricultural Experiment Station, Storrs, Conn.

There are two important factors which determine the economic application of electricity in the heating of incubators for constant temperatures, namely, the insulation and the heating and regulation devices.

Copper is universally used in constructing incubators for laboratory use. With the exception of silver, copper is the best conductor of heat known. The insulating material used with copper is imperfect and not properly applied for preventing loss of heat. Copper incubators are generally water-jacketed and leaks often arise, causing disagreeable annoyances. The duration of the copper is somewhat limited. If such materials as asbestos, hair felt, wood and cork board are selected and used in combination there can be constructed an incubator, fire proof, with almost perfect insulation, and practically indestructible, at about one quarter the cost of a copper incubator. Moreover, the diminished cost of operation will pay for its construction cost in a few years. The writer has constructed one of these incubators out of asbestos, wood, hair felt and building paper with an inside capacity of three and a half cubic feet, which costs less than one dollar a year to heat to a constant temperature of 37° C.

The thermostat is constructed in the form of a V out of strips of brass and hard rubber firmly fastened together. The coefficients of expansion and contraction of brass and hard rubber are very different. Any change of temperature either opens or closes the electrical contact on the right-hand side of the V. The most important item in the economy of this new style of incubator is that the heat is applied to the interior, where it is used and needed. Incubators heated by gas utilize only about half the heat applied, and there is, besides, the danger of fire in operation.

The most satisfactory heater is made of No. 29 30 per cent. alloy german-silver resistance wire wound on a frame which fits into one end of the incubator. Two frames, one in each end, with 58 feet of wire on each frame and connected as one coil, afford the most uniform method of heating. The wire can be obtained from the American Electrical Works, Providence, R. I. The cotton-wound wire is preferable, for it affords considerable insulation. When the heating coils are completed a coat of shellac on the wire and frames serves as an added insulation. The resistance of the wire is 229.9 ohms per 100 feet. The only current that can be used with satisfaction is the alternating or incandescent type with large volume and low intensity. The voltage should be 110 for the length of wire indicated, which will produce about .4 ampere of current.

Keeping Qualities of Butter—Additional Data: Otto Rahn, Michigan Agricultural College, East Lansing, Mich.

Former experiments have proved that rancid cold-storage butter does not necessarily have free acids—indeed the majority of samples had no increased acidity. It seemed probable that the substances causing the taste and odor of rancid butter come from a decomposition of protein. The organisms which in pure culture are able to make butter rancid, such as *Bacillus fluorescens liquefaciens, Bacillus prodigiosus, Oidium lactis,* etc., break down proteids easily. The analytical determination of soluble nitrogenous substances, not precipitated by tannin, copper sulphate nor phosphotungstic acid, gave the *highest* increase in the butter sample which scored *lowest.*

Experiments have been carried on to ascertain if unsalted butter did not keep better in cold storage than salted butter. The supposition was that the water and buttermilk of the unsalted samples would freeze, thus preventing any action of microorganisms, while the concentrated brine of salted butter has a very low freezing point. The result was that the unsalted samples did *not* keep, probably because not all the water was frozen. The unsalted samples scored lower and showed a greater increase of soluble nitrogen.

The only microorganism which multiplied without doubt in cold-storage butter and which occurs in almost every butter sample, is a small *Torula.* This *Torula* is the only microorganism of our butter samples which can develop on agar with 15–30 per cent. salt. A small *Torula* has been found by Rogers in fishy butter. A *Torula* is present almost in pure culture in salted herring and may be the cause of its characteristic taste and odor. The description of the *Torulæ is* incomplete, however, they do not disagree.

Bacillus lactimorbi, Jordan and Harris (nova species)—Its Relation to Milk-sickness and Trembles: E. O. Jordan and N. MacL. Harris, University of Chicago, Chicago Ill.

This organism appears to be a hitherto undescribed bacterium and was isolated by the writers from several cases of trembles in cattle, from one case of the disease in a horse, from two lambs and from four cases of milk-sickness in the human subject. It would seem that the disease in man is incurred through the ingestion of infected milk, milk-products or of meat; in animals by the eating of infected pasturage or by drinking infected water, the contamination of these being from the soil in which the bacterium has its abode.

By means of pure cultures the writers have succeeded in reproducing the essential features of the naturally acquired disease in young rabbits, dogs, calves and one horse; cats and lambs have been infected with the production of pathological lesions, but without any well-defined clinical symptoms.

The organism causing the disease is a strict aerobic, flagellated, sporing, liquefying bacillus about the size of the anthrax bacillus, and very strongly resembling the tetanus bacillus in its most characteristic form. It is, however, very prone to undergo considerable variation in morphology due to methods of cultivation, temperature and fluctuations in reaction of the media being chiefly responsible. Stained with methylene blue the typical tetanus-like bacillus shows well-marked polar metachromatic granules, with at times a central one. It grows either very vigorously or delicately on agar, depending upon whether it is incubated at 25°, 30° or 37° C. Colonies on agar are of a streptococcus type accompanied by a film growth of a delicate nature,

either on the top or on the bottom of the agar surfaces. In glucose agar stab tube no gas is formed and the stab growth is smooth, delicate and whitish. On potato no growth has been obtained, but on Heinemann's synthetic potato medium a so-called "invisible" growth occurs. Broth is moderately clouded and occasionally a delicate surface film is formed. In gelatin the stab extends nearly all the way down the needle-track in a smooth, even manner and of a grayish color; the surface growth is scant, delicate and pearly gray; a saucer-shaped zone of liquefaction makes its appearance upon the surface about the third to the tenth day, and progressively extends outwards and downwards until the whole of the gelatin is liquefied. Occasionally where liquefaction has been delayed feathery outgrowths from the stab have been observed. In litmus milk growth does not readily occur unless the medium has been heavily seeded, then a slow-appearing alkaline reaction makes itself noticeable about the third day at the surface of the medium, which later on extends throughout the tube, eventually rendering the milk semi-translucent; no clotting or proteolytic changes have ever been seen. On Jordan's asparagin medium a well-marked surface film growth takes place with an ultimate slight clouding of the whole medium.

Note on a Lactic Acid Forming Bacillus Closely Resembling B. bulgaricus Isolated from Cornmeal: P. G. HEINEMANN and MARY HEFFERAN, University of Chicago, Chicago, Ill.

During an investigation of yeasts for the preparation of so-called salt-rising bread a bacillus was isolated which, as far as the examination has proceeded, agrees in morphology, staining properties, cultural characteristics and the ability to produce large amounts of lactic acid from milk with the characteristics of *B. bulgaricus*, the organism which has recently received considerable attention and has been recommended by Metchnikoff for the preparation of sour milk. A stain from the mixture of cornmeal, milk, sodium bicarbonate and salt showed a large number of bacilli with the characteristic granular staining of Metchnikoff's bacillus. After cultivation in milk the bacilli stained uniformly. When granules appear the picture recalls somewhat the appearance of small spores and seems to agree with Kuntze's description of his "Körnchen" bacillus. Attempts to obtain these bacilli in pure culture by plating on the ordinary laboratory media failed utterly, but they were readily isolated if cultivated in milk at 37° C. or if plated on milk-agar. The colonies after a few days have peculiar root-like ramifications on milk-agar and may be mistaken for small colonies of *B. subtilis*. In pure culture the milk is coagulated slowly, rarely in less than two or three days. The coagulum is soft and creamy, without the separation of whey, and unlike the more solid coagulum formed by *Streptococcus lacticus*. The amount of lactic acid produced in milk is much higher than the amount produced by *S. lacticus*. After fourteen days 1.65 per cent. acid was determined. By addition of glucose or lactose to ordinary agar a moderate growth appeared after two or three days. If this bacillus is sowed into sterile milk with a culture of *S. lacticus*, acid is formed more rapidly than by either of the two organisms alone and the coagulation of the casein is also more rapid.

Salt-rising bread is started by mixing cornmeal, milk, sodium bicarbonate and salt. It seems that milk is a necessary part, without which probably the bacillus is unable to grow and form the necessary lactic acid for liberating carbon dioxide from sodium bicarbonate. By inoculation of sterilized milk with cornmeal it was ascertained that the bacillus originated from the cornmeal and not from the milk. It is, therefore, quite possible that this bacillus is widely distributed and an investigation is now under way to determine the distribution. We are attempting to isolate this bacillus from a large variety of sources, principally flours, dry fodder, silage, feces of man and domestic animals, sourkrout and other similar substances. The study has extended over a period of a few weeks and we hope to be able to make a more complete report in the near future.

The Gas Production of B. coli: FREDERICK G. KEYES, Brown University, Providence, R. I.

All previous work on gas production has been of little value because of imperfect methods of collecting and analyzing the gases produced.

The ordinary fermentation tube does not give the exact amounts of gas produced because of the solution of the gases in the medium and its diffusion therefrom.

The methods ordinarily used by the bacteriologist for analyzing the gases produced are imperfect because they give merely the CO_2 content and tell little about the other gases which may be present. Also, standard media, even at best, are sufficiently variable to influence materially the amount and composition of the gases produced.

Therefore the writer set about to devise an apparatus which would enable him to collect and

analyze all the gases produced by an organism on a synthetic medium containing substance of known chemical constitution. The results of the use of this apparatus for studying the gas production of *B. coli* are as follows:

	Time in Hours at 37° C.	Total Gas in Per Cent.	CO_2 Per Cent.	H Per Cent.	N Per Cent.
On a synthetic medium in vacuum.	24	28.6	63.36	36.6	0.05
	72	45.7	63.40	36.15	0.45
	115	96.3	63.56	35.94	0.50
On standard medium in vacuum.	48	197.1	55.87	43.50	0.65

The Utility of the Society's Card in Classifying the Cheese Flora: H. A. Harding and M. J. Prucha, New York Agricultural Experiment Station, Geneva, N. Y.

During the past four years the flora of American cheddar cheese has been intensively studied at the New York Agricultural Experiment Station. In connection with this study an attempt has been made to classify the organisms which were found in nine normal cheeses and so characterize them that they may be recognized by succeeding students.

During the progress of this study there appeared a classification of the bacteria of milk by Conn, Esten and Stocking. This work was of material assistance to us and covered the milk flora so completely that all but one of the organisms found by us in cheese is evidently included under the types described by them. This classification as arranged by Conn is an adaptation to bacteria of the conventional botanical system of classification.

The society's card has also appeared during this interval and the cheese flora has also been arranged in accordance with its system of group numbers.

As the result of this double classification the germs found represent 22 types according to Conn or 33 groups according to the society's card. The classification of the germs found in nine normal cheddar cheeses according to each of these systems is given in the accompanying table. This table is taken from Technical Bulletin No. 8, New York Agricultural Experiment Station, in which are given the details of this study.

The amount of data required to determine the group number and the type name is practically the same, but a careful comparison of the utility of these two systems in connection with this study is strongly in favor of the society's card.

This advantage lies in the increased accuracy with which different workers assign germs to like groups, in the quickness with which such assignment can be made and in the ease with which duplicates can be detected or the accumulated stock of records be consulted.

By the use of the card the results of one worker are made immediately available to succeeding workers and each can recognize the forms which have been already described and build upon the foundation already laid. By accumulating results in this way, it will soon be possible to have as exact a knowledge of the bacterial flora of any given class of objects as we now have of the higher flora of a region.

It is believed that the introduction of the society's card will prove the most important addition to laboratory and classification technique since Robert Koch brought out the gelatin plate.

Autolysis of the Gonococcus: C. T. McClintock, M.D., Ph.D., and L. T. Clark, P.S., from the Research Laboratories of Parke, Davis & Co., Detroit, Mich.

Autolysis of gonococcus cultures has been observed and reported by numerous workers.

The purpose of the present study is: (1) to confirm the results obtained by others; (2) to determine the amount of ferment present, the method by which it breaks up the cells and the extent to which the action can be carried; (3) to determine the effect of the resulting autolysate on the growth of the gonococcus, and other organisms in vitro, and (4) to study the effect of the autolysate on the organisms in vivo and its possible therapeutic application.

The results obtained so far are shown in the following conclusions:

Disintegration or autolysis occurs in gonococcus cultures to a marked degree.

This autolysis can be completely prevented by heat alone at 70° C. for one hour, by heat in the presence of trikrisol at 60° C. for one hour, by 50 per cent. and 95 per cent. alcohol in salt solution and partially by 4 per cent. trikrisol alone.

Specimens stained at certain stages of disintegration show numerous fragmentary cell walls still capable of taking the stain, indicating that the cell wall is not completely disintegrated.

The presence of shadow forms in which the cell wall only is stained indicates that the cell contents are either so changed as to be incapable of taking the stain or have escaped from within the wall.

The presence of soluble proteid substances (as shown by their precipitation with acetic acid) in the surrounding liquid indicates that the contents have escaped from within the cell.

Hence it would seem that autolysis of the gonococcus is effected by rupture of the cell wall and escape of the contents.

The products of this autolytic process markedly inhibit the growth of the gonococcus on artificial culture media. Their use in combating the disease in man will form the subject of a future communication.

A Case of Non-inheritance of Fluctuating Variations among the Bacteria: C.-E. A. WINSLOW and L. T. WALKER, Massachusetts Institute of Technology, Boston, Mass.

Aside from its practical importance, the study of variation among the bacteria promises to throw important light upon some of the fundamental biological problems of heredity and evolution. It is important to distinguish two types of possible variations, those which arise entirely from causes operating within the bacterial cell (either mutations or fluctuating variations), and those which are apparently due to the direct or selective effect of the environment. Goodman[1] has recently demonstrated that by selection of variations of the latter sort the acid production of certain members of the diphtheria group of bacilli may be profoundly modified. In the present investigation the authors have attempted to study the inheritance of fluctuating variations in the paratyphoid group, without special selective action. Cultures of Schottmüller's types A and B were plated out and one hundred subcultures of each were inoculated on agar from separate colonies. A dextrose broth tube was inoculated from each streak. The acidities produced were determined by titrating and the results, when plotted, showed two distinct but overlapping curves of frequency with means at 1.4 for type A and 1.6 for type B. The agar streaks of the four extreme cultures (1.1 and 1.6 for type A, 1.4 and 1.8 for type B), were then plated and a series of one hundred streaks made from each. The new curves of frequency for these descendants reverted completely to the original means of types A and B, showing no inherited effect of the variations exhibited by their more immediate ancestors.

[1] *Journal of Infectious Diseases*, V., 421.

Bacteriology as an Important Non-technical Study: H. W. HILL, M.D., University of Minnesota, Minneapolis, Minn.

Bacteriology is now chiefly taught as an art, of use in some branch of science or industry, and almost wholly for its applications in these. Bacteriology is seldom studied for itself *alone*. But it presents many most important biological lessons, as suitable for the illustration of biological truths as any other biological study now taught; and from the control of conditions possible, some phases of biology can be illustrated best by bacteriology. For sociology, bacteriology permits, as no other biological study does, the appreciation not only of the unit, but of the interrelations of units —and hence furnishes a biological study closely paralleling sociology itself. (As a weapon in the hands of a sociologist dealing with hygienic problems it is of course practically a necessity.) Apart from its academic values its chief practical significance to the non-technical citizen consists in the training it gives concerning the *nature*, *distribution* and *life history* of bacteria and in its *technique*, which teaches the fundamentals of *personal* and *family* defense against disease, as distinguished from the measures of public health or state medicine. For these reasons bacteriology should be taught in the public schools, since diffusion of its teachings through the citizens in general can not be obtained in any other way.

NORMAN MACL. HARRIS,
Secretary

UNIVERSITY OF CHICAGO

SOCIETIES AND ACADEMIES

THE SOCIETY FOR EXPERIMENTAL BIOLOGY AND MEDICINE

THE thirty-third meeting of the society was held at Cornell University Medical College, April 21, 1909, with President Lee in the chair.

Members present: Atkinson, Auer, Burton-Opitz, Elser, Ewing, Flexner, Famulener, Gies, Janeway, Joseph, Kast, Lee, Lamar, Lewis, Lusk, Mandel (J. A.), Meltzer, Meyer, Morse, Noguchi, Norris, Oertel, Park, Pearce, Shaffer, Storey, Terry, Wallace, Wolf.

Members elected: John L. Todd, Peyton Rous, H. S. Jennings, Andrew Hunter, Charles R. Stockard, E. E. Southard, William W. Hale.

Scientific Program

R. Burton-Opitz: The vascularity of the spleen as influenced by single nerves of the plexus lienalis.

Richard M. Pearce: An experimental study of the influence of kidney extracts and of the serum of animals with renal lesions upon the blood pressure.

J. J. R. Macleod: Further observations on the effect of asphyxia and curare on the reducing power of the blood after section of the hepatic nerves in dogs.

William H. Park and Eugene Famulener: Toxin-antitoxin mixtures as immunizing agents.

Alfred F. Hess: Antiperistalsis in its relation to tubercle bacilli and other bacteria in the alimentary tract.

Simon Flexner and Richard V. Lamar: The action of soaps on the pneumococcus.

A. O. Shaklee and S. J. Meltzer: The influence of shaking upon trypsin and rennin and a comparison of this influence with that upon pepsin.

Don R. Joseph and S. J. Meltzer: The influence of sodium and calcium upon direct and indirect muscle irritability and their mutual antagonistic actions.

J. Auer and S. J. Meltzer: The effects of local application of chloride and sulphate of magnesium upon the centers in the medulla compared with those of sodium chloride.

J. Auer and S. J. Meltzer: Respiration by continuous intrapulmonary pressure without the aid of muscular action.

Alexis Carrel: Note on the production of kidney insufficiency by reduction of the arterial circulation of the kidney.

Theodore C. Janeway: A modification of the Riva-Rocci method of determining blood-pressure for use on the dog.

Theodore C. Janeway: Note on the blood-pressure changes following reduction of the renal arterial circulation.

H. C. Thacher: The effect of experimental acute insufficiency of the right heart upon the volume of the organs.

The thirty-fourth meeting of the society was held at the Rockefeller Institute for Medical Research, May 26, 1909, with President Lee in the chair.

Members present: Auer, Beebe, Ewing, Famulener, Flexner, Gies, Hatcher, Joseph, Lee, Lewis, Loeb (Leo), Morse, Meyer (Gustave), Pearce, Shaffer, Sherman, Terry, Van Slyke, Wallace, Weil, Wolf.

Members elected: C. W. Edmunds, J. W. Draper Maury, Adolph Meyer.

By-law Adopted: One of the regular meetings may be held annually outside of Greater New York.

Scientific Program

H. Gideon Wells and Harry J. Corper: Observations on uricolysis, with particular reference to the "uric acid infarcts" in the kidneys of the new born.

L. L. Woodruff: Further studies on the life cycle of paramecium.

W. O. Emery and William Salant: On the decomposition of caffein in the liver.

William Salant: The comparative toxicity of ethyl and amyl alcohol and their effect on blood pressure.

L. B. Stookey: Pentosuria.

Elizabeth Cooke and Leo Loeb: The comparative toxicity of sodium chloride and of fluorescent staining solutions upon the embryos of Fundulus.

M. S. Fleisher and Leo Loeb: The influence of calcium chloride and of adrenalin upon the secretion of urine and upon resorption from the peritoneal cavity.

Benjamin T. Terry: Immunity to various species of trypanosomes induced in mice by the cure of experimental infections.

D. D. Van Slyke and P. A. Levene: On the leucin fraction in casein and edestin.

D. D. Van Slyke: On "Clarin," Vahlen's active principle of ergot.

Daniel R. Lucas (by invitation): Some effects of sodium benzoate.

Matthew Steel (by invitation): An improvement of the Folin method for the determination of urinary nitrogen.

P. A. Levene and W. A. Jacobs: On nucleic acids.

Gustave M. Meyer and P. A. Levene: On the behavior of amino acids and glycyl-glycin and its anhydride in the organism of the dog.

I. Levin, D. Manson and P. A. Levene: On nitrogenous metabolism in dogs with gastro-enterostomy.

R. M. Pearce: The depression substance of dog's urine; its disappearance in experimental acute nephritis.

Philip A. Shaffer: Observations on the metabolism in a subject of diabetes.

Eugene L. Opie,
Secretary

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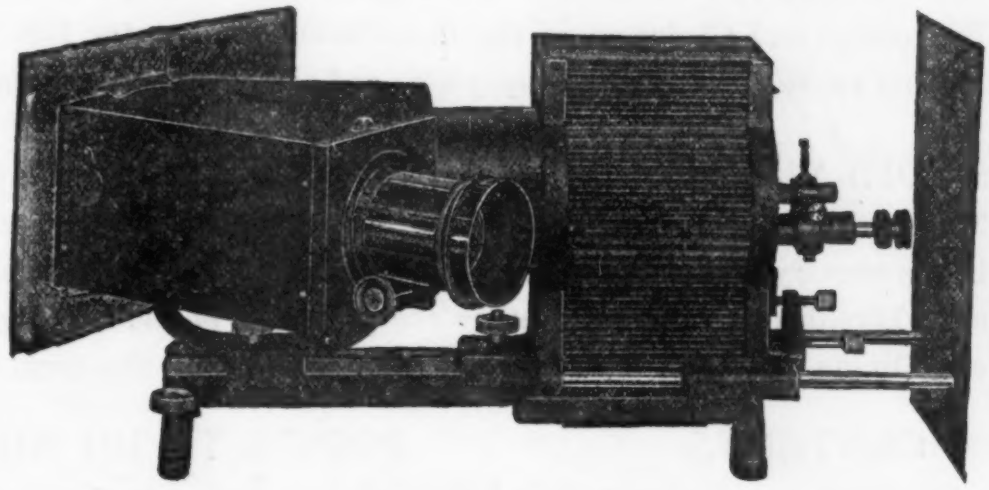

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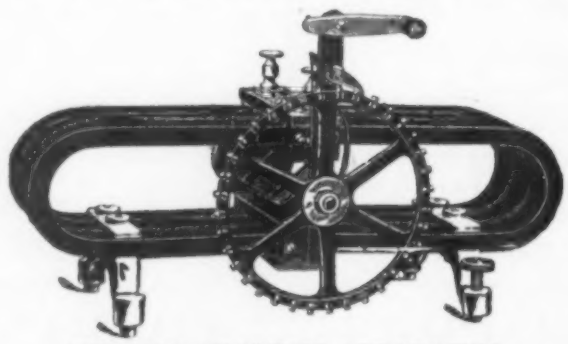

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